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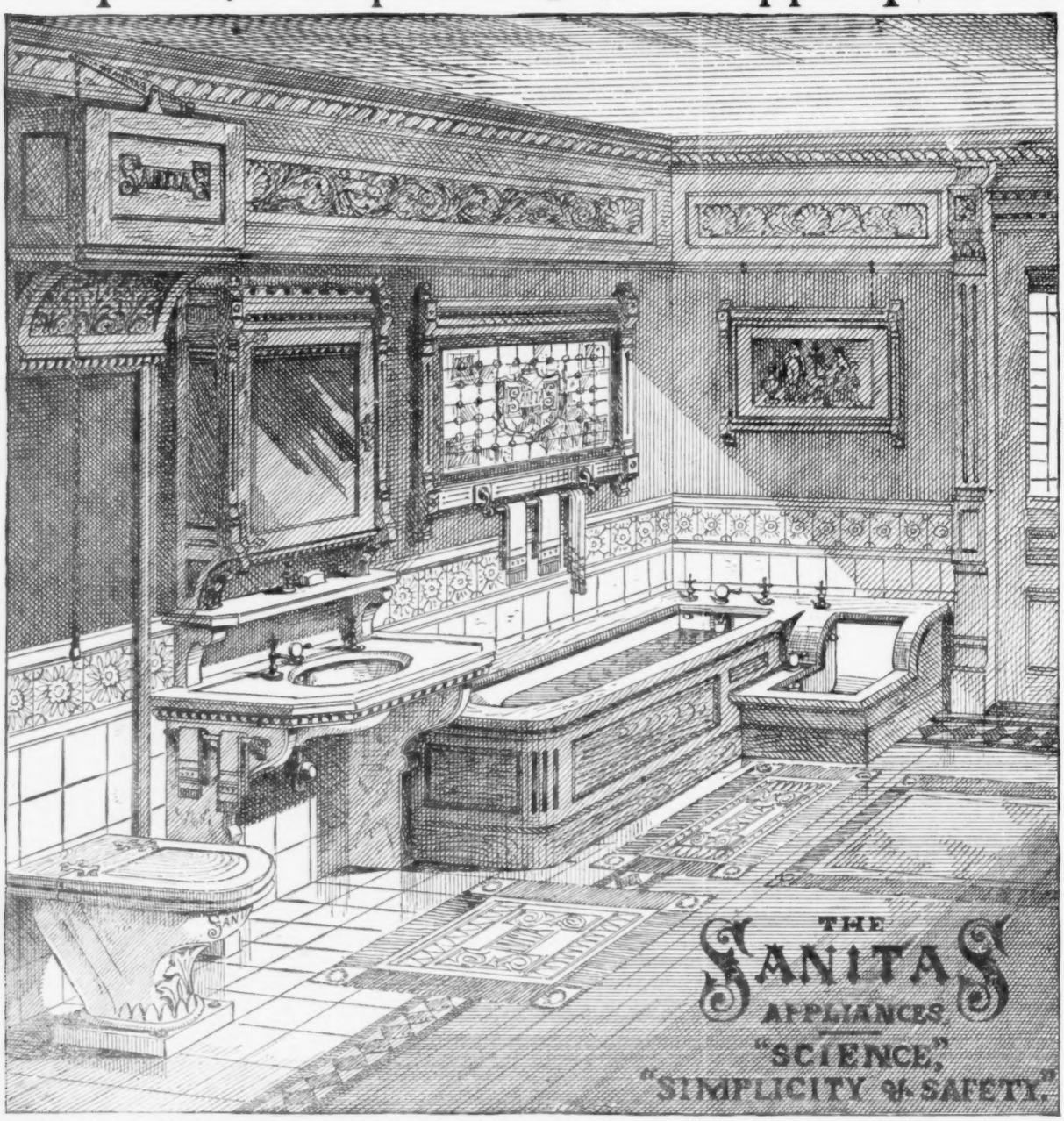
SANITAS ✿ PLUMBING ✿ APPLIANCES



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THE people who take an interest in the subject have for some months suspected that the "Colossal Organization" was in a bad way, and recent developments show that it is on the verge of collapse, if not of complete dissolution. A year ago the officials of the Order of Knights of Labor claimed that they ruled over a membership of a million. We do not imagine that there were ever anything like that number of members in the Order, or that the officials ever did, even if they could, make an accurate count of the membership, but there were at least a good many names on the rolls, and the managers, who seem to think that their duties consist principally in getting themselves interviewed by reporters and reading what the latter say about them, were full of smiles and brag. Now, the reporters who seek the presence of the magnates are repulsed with sour looks, and, instead of boasts about the power and prosperity of the Order, they are treated to muttered threats of the woes in store for "bankers," "capitalists," and various other persons. It would seem as if an official with a salary of five thousand dollars a year might speak with a certain forbearance about bankers and capitalists, and the asperity which the chief of the Colossal Organization shows towards persons who have saved up some money suggests the idea that perhaps his own income is in danger, and that his regret at not having laid by some capital in the time of prosperity shows itself, as usual, by the desire to injure those who have been more prudent. It is certain that the paid officials of the Knights of Labor have some reason to fear for their salaries. If they ever ruled over a million persons, they certainly control now little more than half that number. On every side the local organizations are withdrawing or disbanding, or returning their charters. In some cases, as in that of the carpet-weavers' association, the arbitrary interference of the chiefs of the Order with affairs that did not concern them has drawn several thousand members at once into revolt and desertion, while in other instances smaller assemblies, particularly in the lesser towns, where the native American element prevails, have returned their charters and disbanded, simply from "lack of interest," or, as we might perhaps interpret this phrase, from the innate dislike of Americans to subjecting themselves to irresponsible foreign authority. Taking all the defections together, the number of members who have withdrawn from the Colossal Organization since the strike on the Gould system of railways last year amounts to about four hundred thousand. That strike itself, which was promoted and maintained principally to exhibit the power of the autocrats of the Order in general, and, as we remember, of one in particular who afterwards escaped with the funds entrusted to him to carry on the contest, resulted in a violent revolt against the tyranny of the Philadelphia clique throughout the Southwest, and more than a hundred thousand men renounced their allegiance to it. The next great defection was that of the Cigar-makers' Union, comprising twenty-eight thousand men, who left the Order in a body on account of the interference of its officers with a local strike. Since then, many other associations, large and small, have withdrawn, and the course of the managers, who have apparently become desperate at the prospect before them, is now such as to alienate rapidly the remaining members of the Order. A few weeks ago an attempt was made to induce the Amalgamated Association of Iron and Steel Workers, a very powerful, and, on the whole, well-managed trade society, to join the Knights of Labor in a body. They considered the matter and declined, supposing that this would be the end of it. They reckoned without due appreciation of the power and disposition to do mischief of the chiefs of the Colossal Organization. A strike took place soon after, from local causes, in a steel-working town in Pennsylvania, and the leaders of the Knights of Labor immediately took advantage of it to deal a foul blow at the workingmen who had refused to submit to their supremacy by using all their facilities to bring non-union workmen to the spot to take the places of the men who had struck. With the resources which the Knights possessed a year ago, this would have been a terrible weapon of coercion, to force all workingmen into their ranks under pain of being thrown out of employment at the pleasure of the tyrants by means of a strike prepared for the purpose, but, fortunately for the people, it was apparently not thought of until the advanced stage of dissolution of the Order had made it comparatively harmless. Having now discovered it, however, the magnates seem disposed to use it indiscriminately, and within a day or two they have interfered in the same way in another strike in a New England town, collecting a full complement of new operatives for certain mills on the ground that "they were satisfied with the wages offered," thus displacing from their homes and their living, without any attempt at conciliation or support, several hundred poor people who, without their interference, could probably have settled their dispute by themselves. The unfortunates evicted in this way by their pretended champions were French Canadians, and those familiar with such labor can judge of the sincerity of the claim that they deserved to be driven from their homes for demanding wages in excess of the Knights of Labor standard. A few devotees may believe this explanation, but most people will see in the transaction simply another example of the seizing of a ridiculous pretext by a handful of mischievous and disappointed egotists, to show their remaining power by making a whole village miserable. It will not take many more exhibitions of this sort to complete the downfall of the Knights of Labor. We had rather expected to see the final extinction of the Order preceded by some particularly extensive and malicious demonstration, but there seems reason to hope that the rapid ebb of the power of the autocrats will leave them without resources to effect mischief before they can decide upon a plan of operations, and the people of the United States may congratulate themselves if the end of the Colossal Organization is a peaceful one.

THE history of the business of insuring plate-glass against breakage furnishes some curious statistics, as well as a good deal of information of value to architects and builders. It seems, from the Boston *Transcript*, that, notwithstanding the insignificant appearance of its business streets in comparison with those of New York or Chicago, Boston possesses more plate-glass, in proportion to its population, than any other city in the country, and the insurance companies find much employment there. At present, most of the insurance on glass is done by two companies, the Lloyd's Plate-glass Insurance Company and the Metropolitan Plate-glass Insurance Company, both of New York. The premium is a small percentage on the value of the glass — about two or two and one-half, we believe — and three-quarters of all the plates in Boston are said to be covered. It is estimated that there is one break a year in every eight windows insured, so that the premium does not seem unreasonably high. Losses are settled by the replacing of the glass, instead of a payment of money, and disputes are thus avoided, while the owner of the building and his tenants are spared the trouble of attending to the matter for themselves. In Boston, about one plate a day represents the loss to the companies, and the breakages occur from an almost infinite variety of causes. The usual cause is, naturally, stone-throwing of boys or men in the streets; and out of one thousand breakages, about three hundred are due to this. According to the statistics of the Lloyd's Company for 1885 the most active glass-breakers, next to stone-throwing boys, are burglars, who broke in that year about ten per

cent of all the sheets in Boston, which the company had to pay for. Pistol-shots produce many breakages, and, even in quiet Boston, about one plate is broken by a bullet for every four broken by stones. Next to missiles of various sorts, the wind is the greatest enemy of plate-glass, many lights being blown in by tempests, while many more are broken by the slamming of doors and blinds. Much less pains is taken to protect large lights in Boston than in New York, the rolling-shutters, so common in New York, being rare in Boston, but the premium rates are the same in both places, and perhaps the miscellaneous causes of destruction, which are accountable for thirteen per cent of the breakages, are more active in New York. One of the heaviest losses of the kind that we remember occurred in the latter city some years ago, where a large number of plates of different sizes, intended, we believe, for the front windows of the first story of a hotel, had been taken out of their boxes, and were placed against the wall of one of the rooms, ready for setting. The glaziers were at work, and one of them, looking for the particular light which he wanted next, found it in the interior of the stack, close to the wall. He tried to pull it out sideways, and in doing so tipped the rest of the plates forward. The whole mass fell to the floor with a crash, breaking every plate, and causing a loss of about five thousand dollars.

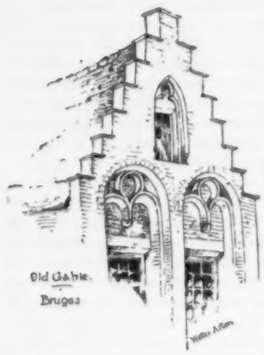
WE regret to have to report that the National Association of Master House-painters and Decorators has fallen foul of the architects, and in the recent Convention of the Association in New York, the members of our much-enduring profession were treated to a scoring which they will doubtless remember. The occasion of the chastisement seems to have been the propensity of architects to get painting work done as cheaply as possible, a tendency which was severely condemned by the Convention, although no method was indicated for correcting it, unless a hint of "boycotting" may be interpreted as significant of the policy to be adopted. The subject was introduced in the Convention by the reading of a paper written by Mr. Joseph Scott, of New York, on "The Relations of Painters to Architects." One would imagine that such an essay might present a very pleasant picture of the manner in which the interior and exterior of buildings may be made beautiful with color by the skilful artisan under the guiding inspiration of the designer of the structure, but instead of this the author complained that "the architect was now the autocrat of the building trades," and that he "took no account of the painter in the specifications," but consigned the man of brushes to the carpenter, "who was solely anxious to get the painting done as cheaply as possible." Why the architect should be to blame for the carpenter's desire to get the painting done at a low price we do not understand. Our impression had always been that in this respect the instincts of the carpenter and the architect were opposed, and that the latter, by requiring skilful work, and rejecting everything else, compelled contractors to employ trained painters instead of the bunglers who lay on white lead and oil for people who do not know enough to distinguish good work from bad. If the architects, by their disposition in this matter, have offended the master painters, the sooner they know what sort of conduct will be more satisfactory, the better for all parties. The complaint that architects take no account of painters in their specifications we can understand, but not credit. When we think of the hours of time, and of all the paper and ink, which we and our friends have consumed in writing painters' specifications, we are struck most painfully by the ingratitude of this charge. It is quite possible that the author of the essay may never have read the specifications prepared for him by architects, and, indeed, we have known some painters who seem to have supposed that architects specifications were not intended to be read, but this is hardly the architects' fault, and certainly should not expose them to public scorn as "autocrats," or other disagreeable things.

SOME time, perhaps not until the year 3000, the relics of our innumerable churches may perhaps afford as much interest to the archæologist of the period as those of the Roman Empire do to us. The Romans, like ourselves, were very tolerant of all sorts of religions, or, more probably, indifferent to them, so long as those who professed them did not meddle with politics; and Rome, with its temples of nearly all the Greek, Egyptian, Italian and Asiatic divinities, to say nothing of the modest meeting-places of the followers of the Nazarene prophet, or of Agrippa's enormous building, dedicated, very judiciously, to all the gods, without insidious discrimination between the true and the false ones, finds a very good parallel in New York, with its Catholic and Protestant churches of every sect and shade, its synagogues of Orthodox, Liberal and Christian Israelites, its Chinese Joss-houses, its Buddhist missionaries, and its radical and socialist organizations. What may be the future interpretation of the so-called Christian symbols with which our Ecclesiastical buildings are, as one might say, peppered, it would be curious to know; but our ancient predecessors seem to have used devices of their own sort almost as liberally as we do ours, to judge from a description in the *Builder* of the remains of a temple to the Persian deity Mithras, which has recently been discovered at Ostia, near Rome. Several temples to the same god have been found in Italy, and as this one, which is the best preserved of all, is attached to a private house, it would seem possible that the proprietor of the house, who appears to have had a Roman name, may have built the temple as a sort of private chapel, finding perhaps a new sensation, which would naturally be grateful to a rich Roman in a seaside watering-place like Ostia, in devoting himself, and converting his friends to the worship of a highly novel and interesting deity. Notwithstanding the novelty, however, the proprietor of the temple seems to have taken great pains, like most dilettanti, to get the details of his undertaking correct; and the mosaic floor of the temple is found to be covered with Mithraic symbols. The most conspicuous of these consists of a representation of a set of seven doors, which represent, by an imagery which, if not particularly subtle, is at least easy to understand, the seven degrees of initiation into the mysteries of the faith. To the doors are added the six planets and the twelve constellations, the amiable emblems of nearly every known religion; and a representation of a dagger serves to recall to the faithful the exploit of the god in killing a bull with such an instrument. Between the entrance door and the first symbolic door in the pavement is a sort of tank, probably covered at ordinary times, which the *Builder* thinks to have been the place for the baptism of the neophytes. This sort of symbolism, stupid as it seems, apparently gave great delight to the proprietor of the temple, and not only the floor, and what remains of the walls, but even the seats, of which there are two rows for the limited congregation, are covered with mosaics of the same sort. We are not much in the habit of designing stories, but it seems to us that a novelist of the romantic school might have a much worse subject than the experiences of the family of the rich convert to Mithras during the construction of his precious temple. A high-minded daughter, and a Christian lover, might be added to the properties of the drama, and the scenes between the rich old proconsul, and his friends who come down to view his religious hobby, with the repugnance of the noble girl, and the final triumphs of Christian sentiment, would afford opportunities for situations quite new to fiction.

M. BERTHELOT, the distinguished chemist, writes to the *Technologiste* some curious observations on the metals used by the ancient Chaldeans twenty-five hundred years ago. In 1854, M. Victor Place, in excavating the palace of Sargon, at Khorsabad, came upon the corner-stone of the building, in a cavity in which had been deposited, as is still the custom, a box containing inscribed tablets. According to the inscription on them, there must have been originally seven tablets, but three had disappeared, and the remaining four were brought to Paris and placed in the Louvre. On examination, one of these tablets proved to be of gold, still retaining its pure color. Another was of silver, easily recognized, although blackened on the surface; and a third was of bronze, almost destroyed by oxidation. The last tablet was of a dazzling whiteness, perfectly smooth and highly polished, and covered with small engraved characters. One theory considered the white substance to be an oxide of tin, formed by the corrosion of a plate of that metal; while another regarded it as oxide of antimony. The main difficulty which these theories presented to the mind of the chemist consisted in the fact that either antimony or tin, in oxidizing, would form on the surface a loose white powder, in which an inscription engraved on the original metal would be completely lost; while the engraving on the tablet was as distinct as on metal itself. An analysis was consequently made of a portion of the tablet, which showed that it was not composed of any metal or metallic oxide, but of a very rare mineral, the pure crystallized carbonate of magnesia, cut into shape, polished, perhaps with the aid of wax, since a trace of organic matter showed itself on calcination, and then engraved.

BUILDING ACCIDENTS.[1] — II.

TALL CHIMNEY-SHAFT ACCIDENTS. — WIND-PRESSURE.



ACCIDENTS to Chimney-shafts in Sheffield and Neighborhood during the Gale on Tuesday, December 16, 1878. — On this date, according to the local papers, there was a "terrific hurricane," which reached its height about 9 A. M., and destroyed a large amount of property, including many factory chimney-shafts.

The most serious was the destruction of a shaft in Grippet Lane, killing seven persons on the spot; three more died in the hospital two days after, five were seriously, and several others slightly, injured. The estimated damage in this case was £3,500, irrespective of a large stock of cutlery in process of manufacture.

This square, brick chimney was built in 1858, and it was stated, at the inquest held upon the bodies of the killed, to have been from one hundred and fourteen to one hundred and sixteen feet high from the ground, and tapered one foot from base to top. The outside of shaft was of the best pressed bricks; the foundations were carried down four feet and built on rock, the cost of shaft complete being £300.

The erection of the chimney was commenced by the owner, a builder, and when a few yards had been erected an architect was called in to design an external elevation, with a cap, in terra-cotta, partly hollow: but he did not superintend its erection, as the proprietor, being a builder, did not require the services of a superintending architect; the shaft was, therefore, completed under the builder's own superintendence. While the chimney was being erected, he thought he would not carry it up to the height at first proposed, because he was of opinion it would be too high; he, however, was, he said, persuaded to do so. When the shaft was first built, it was noticed to oscillate, and ten years before it fell the town council had inquired into its stability, and the builder stated that he strengthened the base, which had the effect of considerably reducing the oscillation.

At the inquest, the architect was unable to give dimensions of the cap, as he gave the drawing to the builder and did not keep a copy. He stated there was a light balustrade at top, but could not form any idea as to its weight; it was, however, larger and higher than was customary. He had seen larger tops on chimneys, some, he believed, in Sheffield. The wind was the primary cause of its failure, but still there were chimneys in the town that withstood the gale.

A witness described the accident as being caused by the gale of wind overturning the shaft at its base, which, breaking again at the centre, fell across the workshops.

After deliberating half an hour, the jury returned a verdict that "the deceased died from injuries inflicted by the accidental falling of the chimney, and they further said the height and width of the chimney at top were too great for the width of base, and dangerous, and that the building of such chimneys should be discontinued in future."

This forms an instance of a shaft being commenced without, apparently, the slightest consideration of the proportion and design. As soon as the work commenced, the builder felt his inability to design the exterior, and engaged an architect to supply one: and, again, when the shaft was partially built, the builder lost confidence and thought he would not erect it to the first proposed height, but ultimately was, he said, persuaded to do so, the result being the chimney oscillated dangerously, and eventually collapsed.

During the same gale, as mentioned in the previous example, the following chimney-shafts were blown down, showing the wind to have had exceptional force:

Western Works (cutlery), *Portobello.*— Chimny fell, carrying with it a portion of the roof and otherwise doing a large amount of damage.

Mortar Mills, Willey Street, Wecker. — Chimney blown down and fell through roof.

Hallcar Works, Spital.— Heavy steel-toy manufactory, the chimney-stack fell upon the roof, completely smashing it. Four persons had a very narrow escape.

Bolsover Street, Palette-Knife Manufactory. — Engine-chimney fell through a workshop, across an adjoining yard and into a blade-maker's shop. One man was bruised about his legs and others narrowly escaped.

Phœnix Foundry, Furnace Hill.— Engine-chimney, sixty feet high, fell, nearly the whole of the débris falling through the roofs of two joiners' shops, and two shops occupied by fitters. Although the men were at work, singularly, they all escaped without personal injury.

Neptune Works, Watery Lane.— Button manufactory engine-chimney stack fell, the larger portion upon a new cutlery shop, and almost demolished it.

Milton Cutlery Works, Milton Street. — A large brick chimney fell upon the steam-pipes, communicating between the boiler and engine-houses. With commendable promptitude the "engine-tenter" pulled out the boiler fires. A large quantity of the bricks and rubbish fell onto a building and almost buried two men and one boy; all three were, fortunately, extricated without serious injury.

[1] Continued from No. 599, page 292.

Norfolk Works, Saville Street.—A brick-chimney shaft, one hundred and twenty feet high, near the forging-shop and wire-mill, which had been noticed to sway much more than usual, broke about the middle and fell onto, and smashed, the roof of the hammer-shop and buried the machinery. Most of the workmen were, fortunately, away, but one man was jammed against a wall and almost covered by the fallen bricks; it took twenty minutes to extricate him, and he was badly injured. Another man, who was engaged in the stoke-hole, near the chimney, at the time of the accident, was severely scalded by steam from a pipe broken by the falling bricks, and crushed about the legs and body. A third man was also slightly injured. This accident wrecked one end of the hammer-shop, destroyed two large cranes, damaged some steam-hammers and a large quantity of tools.

LIGHTNING.

At Smethwick, near Birmingham, the soap-works chimney-shaft, originally three hundred and twelve feet high, has been struck five times by lightning: once during the building, when the chimney had reached about two hundred feet high, and four times since its completion. The proprietors say no very serious damage was done, but once, when, perhaps, the electric fluid was aided by the lime having been abstracted from the mortar by the action of the hydrochloric acid in the escaping gases. The owners were then compelled to take down a portion of the top. The latter four strokes all happened after the lightning-rod had been eaten away at the top by the hydrochloric acid, the remainder of the rod, however, being perfect. The rod was formed of one-half-inch iron, and, being eaten down only a few feet from the top, may have had the effect of diminishing the force of the lightning. The conductor has several times been renewed, but the action of the acid has been so rapid that it has soon destroyed the rod at the top, where it is exposed to the action of the escaping gases. In consequence of the top of the rod being so soon eaten away, the firm had the conductor coated with platinum, with very favorable results.

Whalley Bridge Printing Company, Lancashire. — The chimney at these works, which stands two hundred and forty feet high, was struck by lightning in November, 1878, which dislodged several tons of stonework. This shaft was furnished with a lightning-conductor, which had broken six feet from the top. The termination of the conductor being only some few yards in the dry ground, caused the lightning to rebound up to an office and, doing considerable damage, threw the manager on his back; the fluid following a course of heat into the drying-room, cracked a wall over a yard thick for twenty feet in length, and found its way into a dam and was there exhausted.

The conductor at top being broken, was the first cause of the accident, and the improper termination in the ground completed the disaster, so far as the lightning was concerned. In taking down the top, which weighed about twenty-five tons, for repairs, one of the large blocks of stone fell and caught one of the workmen on the chest, who, being rolled off the scaffolding, was killed. Fortunately, the staging on which the work was being done stood the shock and saved the masonry from dropping into the mill-yard below. The shaft, after being repaired, was provided with a new conductor, made of seven strands of No. 9 copper-wire and sufficiently long at the termination.

Oldham, Lancashire. — The King-Street-Mills chimney was struck by lightning in June, 1879, and was cracked down ninety feet. This chimney had been provided with a lightning-conductor, but, being old and rotten, it had dropped down from the holdfasts and was carried into the mill. The conductor and points stopped on the top of the shaft and conveyed the lightning safely from the top in its downward course, as far as the rod extended, but at the termination a hole several feet square was made by the lightning, through the shaft. Here is a case where it may be seen that had the conductor been in good condition it would have protected the chimney-shaft.

The Howard's Town-Mill Chimney, Glossop, was struck by lightning June 12, 1880, the brickwork falling from the top into the weaving-sheds, where all the hands were at work; one man only was hurt, and he not severely. There are four chimneys belonging to this firm, three of them being provided with lightning-conductors; the one struck was not so protected, it being thought the other three would answer for the one struck. The chimney was shattered for sixty feet down, and it took eight weeks to repair it, the works going on as usual all the time.

LARGE OVERHANGING CAPS.

The possibility of any accident occurring, or of any repairs being required to a tall chimney-cap should be one of the foremost considerations of the architect in designing, as the expense attending such work must necessarily be heavy.

Caps when finished should be a complete whole, or so bound together that the joints cannot open, and should be so proportioned that the centres of gravity of its respective component parts all fall within the outer circle of the shaft on which they rest. On no account should iron cramps be used with masonry as they will oxidise and burst the stone. Heavy and large caps are often the source of great danger, inconvenience and expense.

In one example we have inquired into, a heavy cap on a shaft at a fire-clay works at Huddersfield gave much trouble and expense to the owners. The original cap was a large overhanging one, many of the stones were blown down, and others decayed through the action of the acids emitted from the chimney. The whole cap had eventually to be removed and built up with purposely made fire-bricks. The

firm estimate that the original cap in its erection, removal, etc., cost about £700, and from their experience are convinced no stone should be used at top, any oversailing to be gradually formed by hard-burnt radiated fire-bricks.

The ornamental chimney shafts of the Abbey Mills pumping-station of the Metropolitan Sewage Works, two hundred and thirty feet high, were originally finished at the top by a pyramidal structure, or capping of ornamental ironwork. The ironwork in each cap weighed as much as twenty tons, and was connected with the ground by a copper-tube lightning conductor. It having been found that the brickwork of the chimney was very much fissured by cracks, it was determined in 1883 that the ornamental iron-capping should be entirely removed, and the brickwork and masonry at the top strengthened by three bracings of iron. The removal, reconstruction of cap and repairs was successfully carried out by a London firm, the ascent being accomplished by "laddering" the shafts.

OSCILLATIONS.

It will be remembered that in many instances chimneys have been noticed to have had considerable oscillations previous to their downfall.

The writers have often heard it said that the rocking or oscillation of a chimney rather proves its stability than otherwise. How such an opinion can be held it is difficult to say. The slightest consideration of the subject one would think would condemn such an impression. When a shaft is oscillating, the mortar-joints and bricks are alternately subjected to tension and compression. Is there anything one can imagine more calculated to destroy the homogeneity of the structure, disintegrate the mortar and weaken the shafts? Further, by an oscillation the pressure is taken from one side and thrown wholly on the other, and by increasing the oscillation the resultant pressure would be so far thrown from the centre towards the side that the brickwork would be ultimately crushed and the shaft fall. Square shafts, it will be observed have, here, an advantage over round ones.

There is little doubt, that in the cases given the swaying of the shafts has gradually weakened the whole structure, so that the oscillation increased and ultimately overturned the chimney.

The heavier the material of which the shaft is built, the greater will be its stability, and the less possibility of swaying, as with a given diameter and height the stability increases directly as the weight, and the less the oscillation that will be caused by wind, the inertia of the mass being greater.

ACCIDENTS TO "STEEPLE JACKS" AND WORKMEN.

In November, 1871 a tall chimney was being erected for the Mossbay, Iron Company, Workington, Cumberland, and had reached a height of one hundred and fifty feet from ground. Four workmen entered a cage at the side to be drawn by an engine to the top by means of a rope passing over a pulley. At the height of fifty feet the rope broke and the four men fell to the ground, one being killed; another died shortly afterwards; the third had his thigh fractured and other serious injuries, and the fourth was much shaken.

In 1874 the lightning conductor to a chimney at a machinist's, in Huddersfield, Yorkshire, having been blown down, a portable ladder was being raised up the outside of the shaft to reinstate the conductor. The climber having reached a height of above eighty feet from ground, turned round to get to the back of the ladder, when the holdfast supporting it gave way and the man fell to the ground and was killed.

In August, 1883, a "steeple-jack" engaged in removing a portion of the top of a chimney at the Albion Cutlery Works, Green Lane, Sheffield, over-balanced himself, and fell to the ground, a distance of over seventy feet. Both arms were broken and the left leg fractured and shockingly bruised. He was taken to the Infirmary and died.

Fall of a chimney in Glasgow, two men killed. This accident occurred on Sunday, January 10, 1870, in the yard of a railway-wagon builder. The stalk, which was nearly one hundred feet high, had been deemed insecure, and the men killed were employed, with two others, in lightening the structure by taking twenty feet from the top. For this purpose cross-stays were erected inside the stalk, by means of which the men ascended to the top where they removed the bricks and dropped them down the inside, whence they were taken by the other two men at the bottom through an aperture which had been made about five feet high and three feet wide. While they were so engaged, the shaft suddenly gave way at the bottom. The result was, the men working aloft were both killed, but those at the bottom escaped without injury. The accident was said at the time to have been occasioned partly by the aperture made at the bottom of the shaft and partly by the weight of the men working at the top. These may have been the ultimate causes of the collapse, but the primary one no doubt existed, and the stalk *per se* must have been insecure, for two men at top and a hole three feet square to overthrow it, when it is remembered flues of this size are frequently left in shafts and workmen and hauling-tackle are at the summit during their construction and while the mortar is still green.

CAUSE OF ACCIDENT DOUBTFUL.

In the following example is illustrated the difficulty of arriving at the cause of some accidents. From the evidence given at the inquest, the shaft appeared to have been built in a most careful manner, but this evidence did not explain away the fact that the chimney fell. At the time an animated discussion took place in the technical journals, but without arriving at any conclusion as to the cause of the accident.

Northfleet Cement Works chimney disaster, October 2, 1873, six workmen killed and eight injured. Height of shaft from ground line, 220 feet; weight 1,674 tons, part forming cap nineteen tons three hundredweight. It was stated at the inquest that the materials used were of the very best, and the workmanship perfect. About sixty feet fell down without warning and apparently without cause. The chimney was described by the architect as being built with "half-brick" bond, which contains at least twice as many stretchers as would occur in old English bond. The same quality of brick was used throughout, and the mortar composed of the best Dorking gray-stone lime and Thames sand. At intervals of about three feet two courses of brickwork successively were built with the vertical joints dry and then grouted with neat Portland cement. The cap was formed entirely of brick in cement, and the cement here as elsewhere was of the best, and was used with a small quantity of mortar. The idea was that, though the ultimate strength of cement and sand might be as great, yet the cement and mortar would adhere to the bricks better at the beginning. Whatever may have been the cause, it appeared after the accident that a considerable part of this cement and mortar had not set with the firmness of the neat-cement grouting; and though it is hard to see how, on a quiet day, this imperfect setting could have caused the fall, it may have helped to make it possible.

This shaft was rebuilt according to the original design and finished in August, 1874. Special precautions were taken in the rebuilding to ensure that all the bricks were wetted before being laid, and that none of the mortar or cement should be worked up again after being spoiled or "killed." The same architect and contractor for the labor were employed, the proprietors supplying, as in the original shaft, their own materials. R. M. and F. J. Bancroft.

"ADOBE-TOWN."—PASO DEL NORTE, MEXICO.

Street in Adobe-Town.

It is a common saying on the borders of Mexico that "when you have seen one Mexican town you have seen them all." Of the towns where *adobe* is the only building material used this is quite true. A description of one would serve for a description of hundreds which might be named. As the basis of my description of "Adobe-town," I shall employ notes principally made in Paso del Norte, Mexico, the scene of an international episode several months since, and therefore well known, by name at least, to American readers.

Adobe is considered so characteristic of Mexico that it is often applied, by way of slang, by the Americans of the Southwest, to almost everything Mexican. Its application to the coinage of the country is quite general. The silver dollar of Mexico is currently known as an *adobe*, frequently contracted to *'dobie*. The dark-complexioned inhabitants of the country, some of the articles of food peculiar to the land, and even the language spoken there, are sometimes called "*adobe*."

An explanation of what an adobe really is may be unnecessary to the reader, but it may not be amiss to describe the simple process by which one is made, or rather *three* are made, for they are invariably moulded in triplets. The ordinary brown clayey soil is moistened in pits, and chopped straw is mixed with it. The worker—wearing a broad-brimmed straw hat and a suit of loose linen, with sleeves and trousers rolled up as far as possible, exposing limbs as brown as the soil in which he works—forms a picture worthy of Millet. In mixing the mud and straw he uses feet and hands freely, though tools of rude construction stand ready for use when absolutely needed. A simple wooden frame is used as a mould. It is wet thoroughly to prevent the mud from adhering to it. Being placed on the ground, straw having been first spread out to prevent the new and soft adobes from reuniting with the ground, the three compartments are quickly filled with the mud, which is smoothed off with the hands. The moulding-frame is raised, and three adobes, each about two feet long, a foot wide, and four inches thick, lie upon the ground ready to harden in the sun. In a day's time the ground is strewn with adobes. Under the direct rays of the sun the upper surface soon begins to dry. They are then turned up on edge, and other surfaces exposed. After several turnings, they are sufficiently hard to be used for building. Usually, the adobes are made upon the ground where the building is to be erected, and the adobe mud is used as mortar. Unless plastered, therefore, an adobe house is of

the same color as the soil upon which it stands. In such a case, it is not at first sight at all attractive. It is only upon intimate acquaintance that it is found to be not so dreary and cheerless as it at first seems. If surrounded by vegetation of some kind, it is not lacking in picturesque features.

In some localities the soil is such that adobes can be made which will prove quite durable — the reputed oldest building in the United States is an adobe dwelling in Santa Fé, New Mexico — for numerous specimens of adobe architecture exist in the southwestern part of our country, indeed as far north as the States of Kansas and Colorado, though Adobe-town, pure and simple, only exists at present within the borders of Mexico. Generally, however, a heavy rain softens adobe, and wherever heavy rains are prevalent, it is necessary to construct the buildings so that the walls will not be exposed to the weather.

A town of adobe naturally presents a very monotonous appearance. Plastering the exterior of the buildings prevents the walls from washing away in rainy weather and gives them a neater appearance, but does not relieve the monotony to any extent. The buildings are of one story, with flat roofs, from which water-spouts project at intervals of about eight feet. Every house is built around a *patio* or court-yard. An immense doorway leads from the street into the *patio*, and it is upon the *patio* that rooms open. Windows are not considered indispensable in Adobe-town, but when a building has them, they open directly upon the street, are as large as doors, and are covered with lattices of wrought-iron or sometimes of elaborately carved wood.

My feelings upon first looking into an adobe house which was to be my home for some length of time (two years as it afterwards transpired) are not to be forgotten, though they are not easily described. The door of my room opened directly upon the sidewalk which was two feet higher than the hard earth which composed my floor. The side walls were neatly whitewashed. There was a fire-place in one corner, otherwise the floor and walls were utterly blank. The ceiling was a curiosity: logs, stripped of the bark, were laid across the room forming rafters; over these were laid slender poles and over the poles a thatch composed of bamboo. The roof over this thatch

Mexican Ox-Cart.

was, like the floor and side walls, of adobe. Mexico it is well known, is a land of innumerable insects of venomous tendencies, so that the poles and thatch visible between my rafters were unpleasantly suggestive of snug harbors offered to centipedes and scorpions. On several occasions those insects actually did drop from these hiding places, but fortunately no accident occurred. Unattractive as this room was at first, it did not take long to become accustomed to it, and it was not difficult to so far improve its appearance as to make it both comfortable and inviting, so that when I finally turned my back upon it forever, it was not without some regret.

The comforts of an adobe house are briefly told. It is cool in summer and warm in winter. As usually built it possesses no windows. The doors and fireplace are the ventilators. All through Mexico the nights in winter are quite cool and the fireplace is quite as necessary for heat as for ventilation, and the *mesquite* roots used as fuel there make a fire which is both warm and in appearance cheerful.

The American colonist in Mexico will do well to accept the adobe as he finds it, or he may adapt it to his own ideas of comfort and beauty. The latter can be done by plastering the exterior and marking it off with lines to give it the appearance of stone; adding a peaked roof with an iron cresting which greatly adds to its outward elegance; putting in floors of wood (though it may be remarked in passing that the earthen floors seem generally free from dampness, of which they might at first be suspected); making a ceiling of domestic stretched upon frames, thus lessening the risks of having scorpions and centipedes drop from above; and using doors and windows of American manufacture. A gallery or piazza above should surround the *patio* and the *patio* itself will afford an excellent opportunity for floriculture. The result of this experiment will be a house suited to the climate and withal attractive within and without. Excepting for dressed lumber the expense of building such a house would be very small.

It has always seemed strange to me that after plastering the exterior of adobe buildings no effort should be made to select some color for them which would be agreeable to the eyes under the glare of a semi-tropical sun. The adobe buildings used by the officers of the garrison at Santa Fé, New Mexico, are thus painted with good effect, but in most Mexican towns the glare of the sun is intensified by reflection from walls of white. Nowhere does the eye rest upon an object that is not painful to the vision. That may be one reason why cataracts and other diseases of the eyes are so prevalent in Mexico.

Every Mexican town, large or small, has its *plaza*. It is the centre of its religious, social and business life. In it the band (and every Mexican town has its band) plays on stated occasions, and around it the people promenade. It is usually provided with seats of adobe or masonry arranged in concentric circles and quadrangles, and it is sometimes shaded with trees and made a *parterre* of roses. Upon it front the business houses, the residences of the richer citizens, and invariably the principle church.

It is the church of Santa Eulalia which dominates the plaza in our Adobe-town, — a curious structure worthy a minute description. Let the accompanying illustration suffice as to its exterior and surroundings. The interior is yet more curious. It contains a score of quaint objects, which it would be impossible to enumerate here. The sacristy contains quaintly carved chests of drawers, and church records going back to the year 1682. Back of the sacristy is an old lumber-room, filled with all sorts of articles used in the high religious functions frequently to be seen in Santa Eulalia. The ceiling of the church is an elaboration of the ceiling already described. The transverse beams are carved with a large lozenge pattern, in the

Santa Eulalia, Paso del Norte, Mexico.

centre of each lozenge being a many-petaled flower. To make this flower more flower-like, a carved peg about four inches in length is driven into it, to represent in a rude way the stamens and pistil. The effect of hundreds of these flowers is very singular. The ends of the rafters rest upon huge brackets also elaborately carved. The poles above the rafters are stripped of their bark, and are laid with great regularity diagonally across the rafters. All the woodwork of the church is hewn, and pulpit, chancel-rail, doors and choir are profusely carved. The carving is rudely done but time has softened some of the outlines, for, traditionally at least, the work was done two centuries ago.

The tower of Santa Eulalia is rather an innovation upon the prevailing style of architecture in Adobe-town and creates the suspicion that it is a comparatively recent structure, though the only way of reaching the gallery of the church is through the tower and over the roof of the wing to which it is attached. The spiral steps leading up into the belfry are of roughly hewn logs. A pole runs through the logs at one end fastening them together, one above another. The logs are spread out at the other end and embedded in the wall. The bells hanging in the arches of the tower are rung by means of cords fastened to the clappers.

Back of the church of Santa Eulalia is a row of buildings which might lay claim to historic interest. One of them was the prison of the American citizen whose arrest and imprisonment, about a year ago, was the subject of much discussion in two nations. The others were at one time the headquarters of the Mexican Republic: it was during the Empire when the French troops had driven the president from the city of Mexico and he sought refuge in Paso del Norte.

In one of the suburbs of Adobe-town stands an old adobe church which I used occasionally to visit, being attracted by the ludicrous effect produced by attempts recently made to renovate and modernize it. To that end modern wall-paper had been put upon the chancel walls — the design however being far from ecclesiastical. Upon the ceiling of the chancel were hung perforated and scalloped tissue-papers of various colors, such as are sometimes seen in corner-grocery stores. In lieu of pictures, upon the walls back of the altar, hung *seventeen mirrors* of different sizes and shapes. The Mexicans are fond of mirrors — there were five in my room in Adobe-town.

ARTHUR HOWARD NOLL.

A FORTIFIED CHURCH. — The little village of Landwehrhagen, near Münden, is among the very few in Germany which may still boast of a fortified church, dating back as far as the fifteenth century. The stonework surrounding it, and chiefly protecting the entrance, contains a number of port-holes, and was strong enough in the Seven Years' War to withstand the attacks of the French, escaping with but little injury. In view of a recent decree of the communal authorities, ordering the destruction of this interesting historico-architectural relic of the Middle Ages, numerous petitions are in circulation favoring its preservation.— *Paris American Register.*

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF H. A. C. TAYLOR, ESQ., NEWPORT, R. I. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

[Helio-chrome, issued only with the Imperial Edition.]

AN EXHIBITION OF PEN-AND-INK DRAWING. BY MESSRS. F. H. BACON, BOSTON, MASS.; E. E. DEANE, BOSTON, MASS.; W. EYRE, JR., PHILADELPHIA, PA.; H. FENN, MONTCLAIR, N. J.; D. A. GREGG, BOSTON, MASS.; H. P. KIRBY, PITTSBURGH, PA.; B. LINFOOT, PHILADELPHIA, PA.; H. NEU, NEW YORK, N. Y.; J. C. STEVENS, PORTLAND, ME.; C. H. WALKER, BOSTON, MASS., AND J. D. WOODWARD, NEW YORK, N. Y.

IF any one be disposed to doubt whether or no the various architectural journals are doing anything to advance the art whose interests they are supposed to foster, let him turn back to the early volumes of the *American Architect*, for instance, and compare the results achieved by the best architectural draughtsmen of those days with the artistic renderings which the ever-increasing band of clever workers in pen-and-ink are nowadays capable of producing.

Having long been conscious of this advance, and believing that American work in this particular line was as good and interesting as any produced by artists of other nationalities, we conceived the idea that a good deal could be learned by studying the methods which artist-draughtsmen should employ in representing the same subject. Accordingly we invited a dozen artists — we forbear to use a qualifying adjective — to take part in an exhibition of pen-and-ink work, and it is with much pleasure and with no little gratitude to the contributors that we place the results before our readers this week; and, as the result is in our own eyes far more interesting than we had dared to hope, we trust that the ordinary quota of domestic architecture will not be missed.

Premising that these illustrations represent an exhibition pure and simple and in no sense a competition, we must say that in selecting those whom we desired to take part in the exhibition we picked from the ranks of the best workers those who seemed to have a pronounced individuality of style — that is, we refrained from asking certain persons to take part, simply because we had already secured a contribution from some one who worked in their favorite vein. In a general way the drawings have all the individuality we expected, and yet we are rather surprised to find that they can be very easily and properly grouped into three general classes. We will, however, leave each observer to make his own classification.

After having made our selection of architectural draughtsmen, it occurred to us that it would be interesting to see how artists of other professions would treat the subject, and we accordingly invited Mr. Harry Fenn and Mr. J. D. Woodward, both well-known illustrators, to take part. [Mr. Fenn began his artistic career as an engraver and Mr. Woodward as a landscape painter.] The drawings of these two gentlemen and those made by Mr. Gregg and Mr. Deane should be considered rather apart as the work of what we may style, for the moment, professional picture-makers in black and white, though the last-named gentlemen confine themselves almost wholly to architectural subjects. The other drawings are made by architects or draughtsmen to whom the making of a pen-and-ink drawing affords a grateful relief from the routine of daily office-work.

Each exhibitor was furnished with a small photograph of the subject and a sketch outline in blue — merely to secure the same size of drawing. The only suggestion offered by us as to how the subject should be treated was that each artist should make such a drawing as he would naturally make if he sat down with the subject itself before his eyes. We are sorry that we can say nothing more concerning the subject — a photo-caustic print of which is published with the drawings — than that it is situated somewhere in Normandy. Near what town it stands and for what purpose it was originally built we have not been able to discover. It was selected merely as being a good subject for our purpose.

A NORMAN VIEW — SUBJECT FOR A PEN-AND-INK DRAWING.

THE NEW ARCHÆOLOGICAL MUSEUM OF ROME. — The construction of a special archæological Museum at Rome is reported to be secured, the negotiations between the Italian Ministry of Public Instruction and the municipality of the city having come to a satisfactory termination. As the plans are already prepared, it is expected that a portion at least of the proposed building will be shortly completed, with a view of concentrating the abundant and valuable material which is now distributed in the various collections in Rome. The total cost of the buildings is estimated at 2,204,989 lire (£88,000), of which the Government will contribute two-thirds, the Municipality at most one-third. The site selected for the new museum lies between the Cœlian and the Esquiline. The museum, when finished in its entirety, is to receive all art treasures and antiquities already found; and all future discoveries in the city and province of Rome; but the collections contained in the Capitoline Museums are to be retained there intact. — *The Builder.*

DRAINING THE VALLEY OF MEXICO.

FOR four centuries the waters of the firmament have been tumbling down each summer into the vast basin which the world knows as the valley of Mexico. The Aztecs had a lake city, a lacustrine metropolis, and as they did much of their locomotion in canoes and pleasure barges, they did not mind it very much; but when the Spanish conquerors built a stone city here, and filled up low lands and raised existing causeways, they undertook a battle against floods comparable only to the work of the Hollanders, who have made a kingdom out of what was the bed of the ocean. The Spaniards nor the Mexicans have been able as yet to do what the Hollanders have done, viz.: to make dry land where once was water. From the time of Humboldt down to the present year the question of the drainage of the Valley of Mexico has been the theme of learned men. It is acknowledged to be a great work, but is no longer regarded as stupendous, for modern machinery will dig the grand canal to carry off the waters of the lakes and give outlet to the annually recurring rains, and do it all in vastly less time than peon laborers. The Cleveland, O., company which has undertaken to dig this canal will soon be showing the dwellers in this valley the greatest spectacle they have ever witnessed, and will, with their huge excavating-machines, throw out dirt by the ton where a peon would be lugging a sack of earth on his back a few rods. So confident are the Bucyrus Construction Company of doing this work to the entire satisfaction of all concerned that they have accepted a contract for excavating only 1,000,000 cubic yards, trusting to proving the capacity of their machinery for getting the whole contract, except the tunnel through the mountains, which is to carry the water into a river, which will finally empty the city's drainage into the Gulf of Mexico. The tunnel is a government undertaking, and is likely to be put through rapidly. The magnitude of the task will be seen when it is said that some 1,300 square miles contribute their waters to swell the lakes which surround the city, and which at this moment are so full that for miles around they flood the country. It is almost by a miracle that the city escapes an inundation such as that famous one which, more than 250 years ago, submerged the streets of the capital and did not subside for four years, a most calamitous event, which depopulated the city and almost entirely destroyed commercial business here.

As the progress of the work of draining this valley, soon to be begun, will interest engineers and sanitarians the world over, I will give, in as brief space as possible, an account of the condition of this problem, as it presented itself in former times and as far back as the reigns of the later Aztec monarchs. The story is not a tiresome one, and is, in fact, occasionally somewhat humorous.

This City of Mexico was in ancient times situated in the midst of the brackish waters of Lake Texcoco, now withdrawn several miles from the town, and serving nowadays as a place of deposit for such part of the city's sewage as manages to reach the lake. At the time of the conquest the city was intersected by canals, crossed at intervals by wooden bridges. The canals were alive with boats and barges bringing to the market-place the vegetable and floral products of the surrounding country, building-material, poultry, etc. Many of the suburbs were built in the waters of the lake, being supported by piles, and the canoes of the householders were tied under their dwellings, into which access was had by a hole in the floor. On the waters of the lake were manœuvred the war fleets of the Aztec kings, and it was on this city-encircling lake that Cortez launched his brigantines for the siege of the capital. As has been said, the lake was brackish or salt, the saline quality arising from the presence in solution of muriate and carbonate of soda. This saltishness of Lake Texcoco is still its distinguishing quality, and even now the salt water of the lake, penetrating the soil under the city, make it difficult to maintain a healthy growth of trees here. As the trees grow and send their roots deeper they strike the salt water beneath and gradually die a wasting sort of death.

The Aztec City of Mexico was connected with the mainland by three huge dikes, or causeways, a sort of combined water-barrier and raised roadway, and a fourth dike led out to the island, now the hill, of Chapultepec. The Spaniards, on taking the city, threw down the great temple and demolished the stone edifices, casting the *debris*

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VIEW IN NORMANDY

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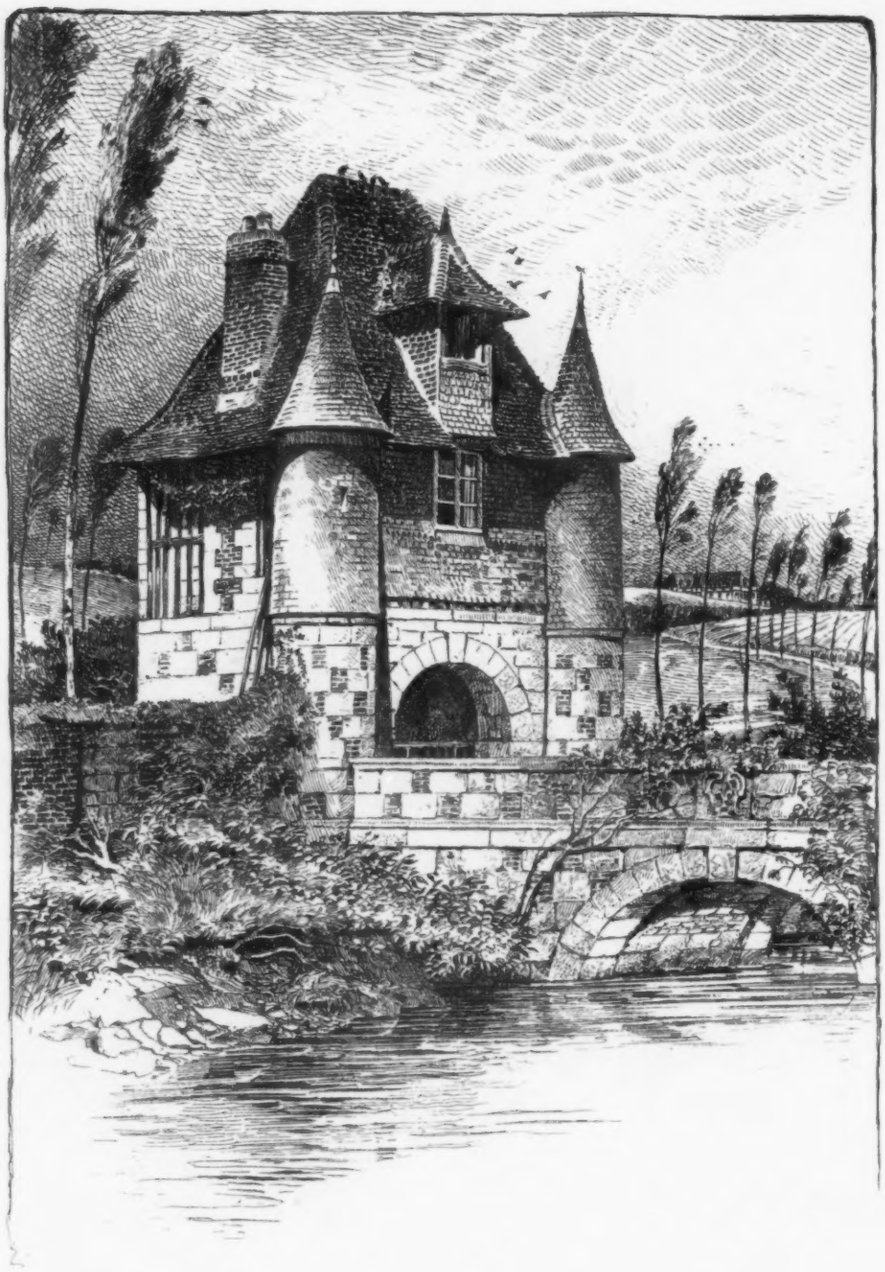

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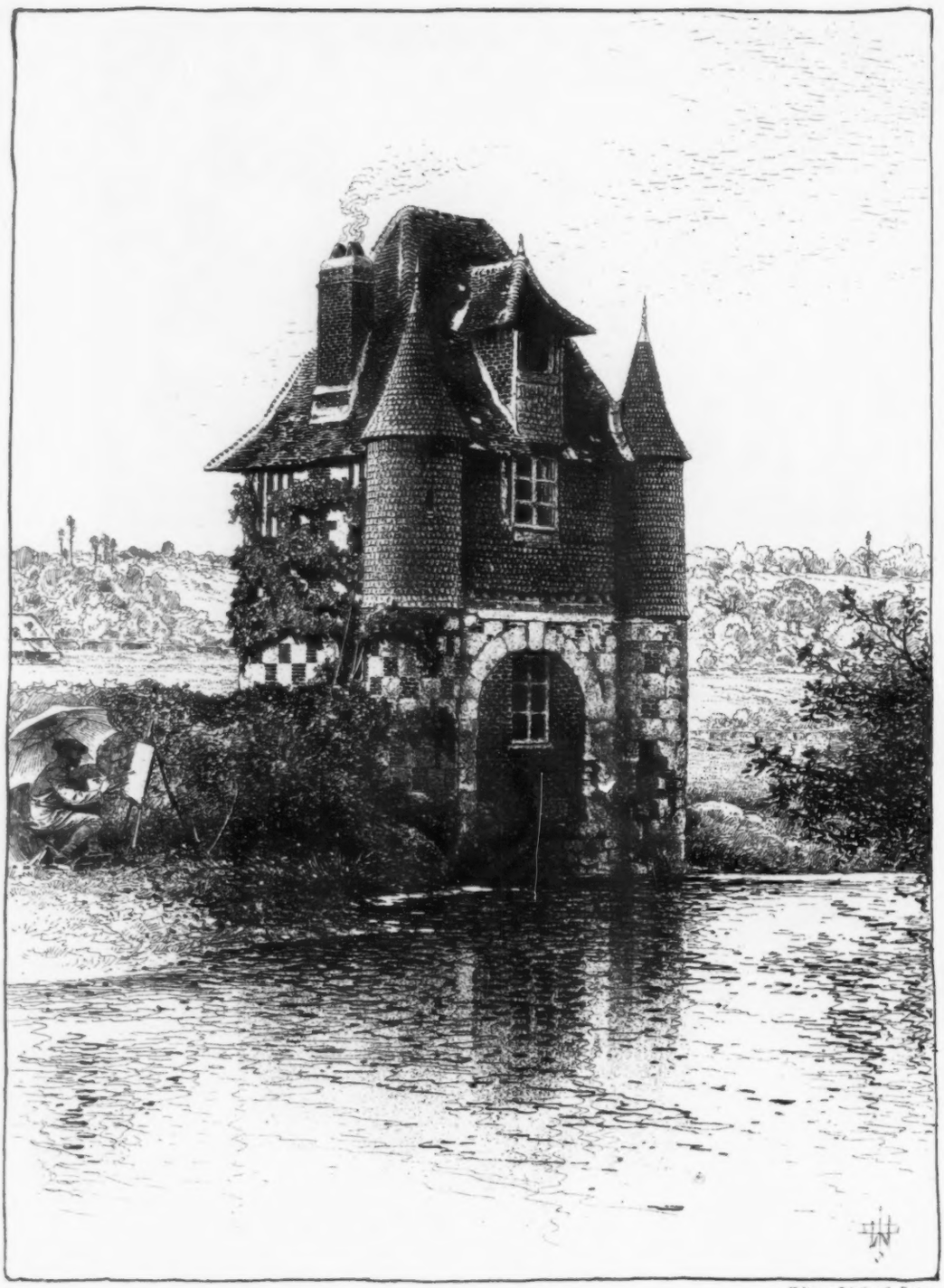

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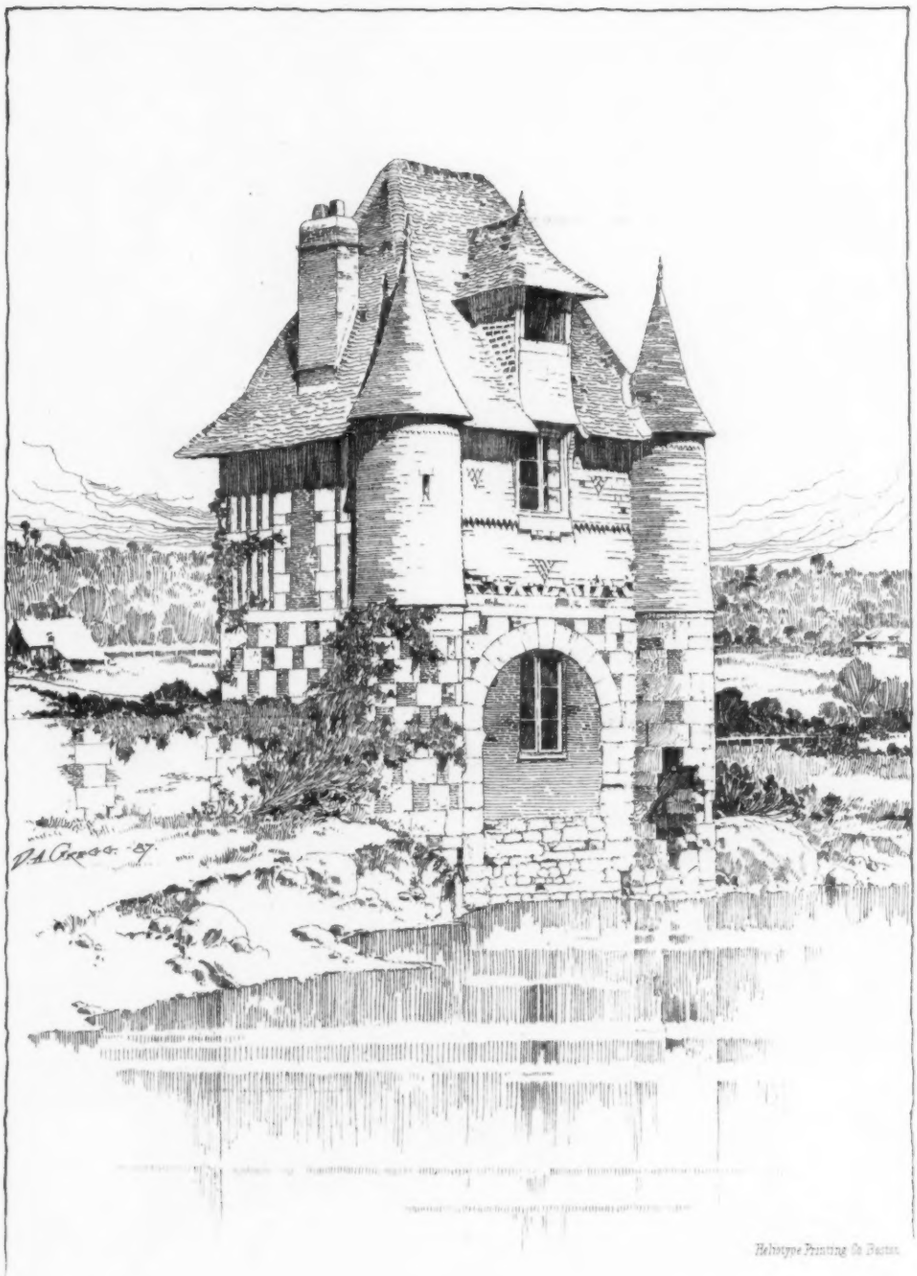

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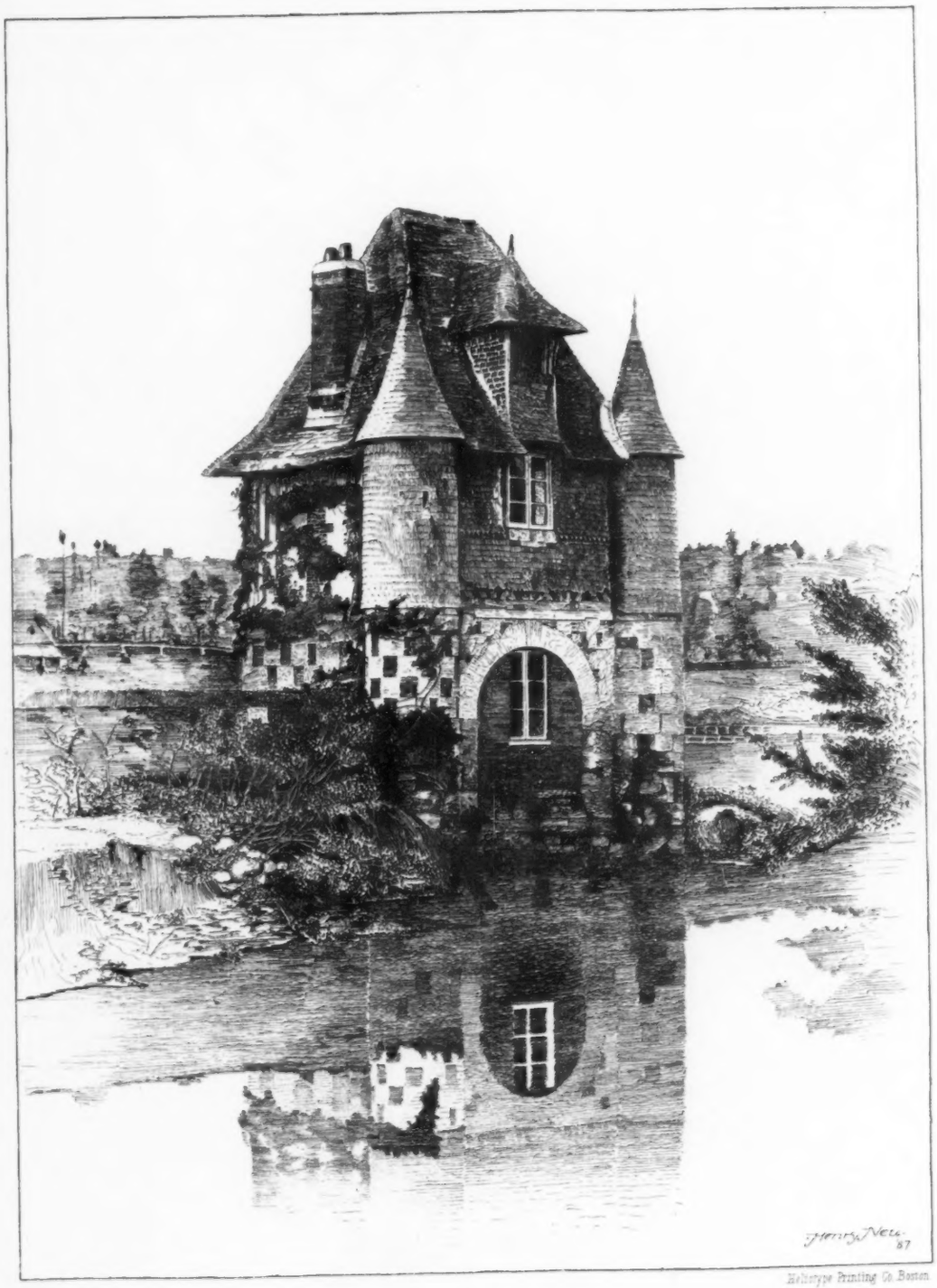

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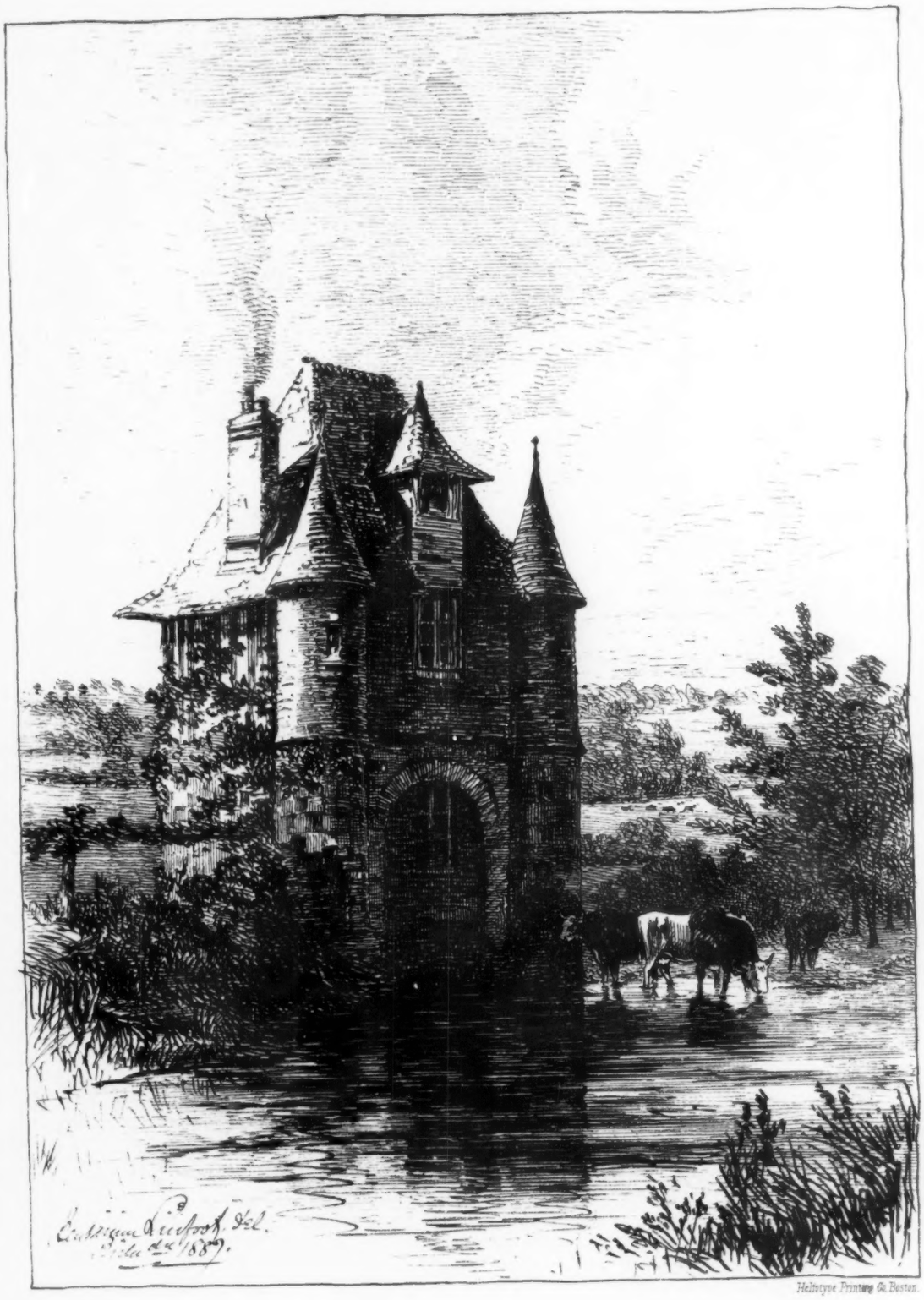

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PEN-AND-INK DRAWING BY BENJ. LINFOOT.

into the canals, so as to make dry roadways of them. Thus, gradually, the Venice-like aspect of the city was destroyed and Mexico remained a compact sort of island in the midst of the lake. This Texcoco, salt, and alternately rising and falling according to the prevalence or abatement of the east winds, was regarded by Cortez and his companions as a sort of inland sea. An odd sort of sea, resting in the shallow basin fully 7,000 feet above the level of the ocean at Vera Cruz!

Even as an island, cut through by many navigable canals, Mexico was subjected to great floods, which, however, did comparatively little harm, as the houses were so raised as to prevent trouble in case of freshets. During the reign of King Ahuizotl the waters of Lake Texcoco had fallen so much that, to enable navigation to be kept up between Mexico and the city of Texcoco, on the eastern shore of the lake, an aqueduct was built to replenish it. Without doubt the reckless destruction of the forest trees in the valley and on the surrounding mountains, begun and kept up by the Spanish conquerors, had much to do with the later drying-up of so large a part of the lake. The Spaniards wanted the landscape to resemble that of the arid and bleak plains of Castile, and they worked with energy to denude the land of trees. How well they succeeded is now easy to be seen. And the process of drying-up the lake was hastened at the same time by the rapid evaporation due to the altitude and the tropical sun. When, later, the great drainage canal of Nochistongo was opened, the lake again felt the effects of carrying off those surplus waters of the higher level lakes which formerly had fed it every rainy season.

The lakes of the valley of Mexico are the natural basins into which flow the waters from the surrounding mountains. These lakes lie at different levels, and it was on account of their inequality of height that inundations occurred in the early history of the capital. The inundations all came in the same way. The Lake of Zumpango was first filled to overflowing by the summer rains and by the inflow of the waters of its swollen tributaries, and when Zumpango was full its waters rushed down into the Lake of San Cristobal. Then the floods from this overfull basin would burst the dike separating it from Lake Texcoco, lying at a lower level than the city, and Texcoco, swelling to huge dimensions, would send its surplus waters flowing over the plains of San Lazaro, penetrating into the city. The course of these ancient inundations was from the north and northwest, and the great cut of Nochistongo was made to carry off the surplus of Lake Zumpango which did such damage to dike and city. Although the lakes of Xochimilco and Chalco offer few dangers for the city, yet, should the snows of Popocatapetl be melted suddenly by heat, these lakes would so fill up as to flow over into the city. Texcoco, though lower than the city, is gradually filling up with solid sewage matter and mud, and as the level of the lake is thus rising, the danger to the city becomes every year greater.

It is very interesting to note the earliest operations to prevent the city getting too much water. The Aztec engineers started out by building dikes, as before shown, and great reliance was placed on these huge constructions, miles in length, and broad enough to enable an army to march thereon. Montezuma I. ordered the construction of these important hydraulic works. Later on, during the reign of King Ahuizotl, there came a great inundation, resulting from the monarch getting the notion into his head that he was a competent civil engineer. He undertook, as I have shown, to remedy the growing scarcity of water in Lake Texcoco, which then surrounded the city, and to this end built the supply aqueduct already noted. While he was going on with this work a citizen of some note at the capital, a man rejoicing in the odd name of Tzotmatzin, predicted publicly that the consequence of the King's work would be the flooding of the city. But Ahuizotl had got a very well developed case of "big head," and in his anger he ordered the unfortunate critic, who, perhaps, ran a newspaper, to be publicly killed as a warning to other captious people. So the work of building the supply-aqueduct went on, and when it was formally opened, the water came pouring into the lake, to the great joy of the merchants who traded with the translacustrine city of Texcoco. But Ahuizotl was soon made ridiculous enough, and the prediction of the sage Tzotmatzin was amply carried out. One day the heavy rains brought, *via* the supply-acqueduct, a great influx of water into Lake Texcoco, and the City of Mexico was flooded to such an extent that the hapless King Ahuizotl, waking up in the night, found his bedroom afloat, and had to swim for his life, and, in trying to find egress through an open door, was swirled about by the rapid current and cut his head. I imagine that at that moment the overconfident king did not think so much of his engineering qualifications.

After the conquest the dike system was kept up, but, notwithstanding the enormous amount of work put out on this sort of work, the city kept on getting flooded. At last the Spaniards found that they would have to abandon the Aztec engineering scheme and try something beside dikes. The city had, by that time, become a quite different place than it was under the Montezumas. It had a very few canals, and the people lived in houses built directly on the ground, and thus floods in the city were vastly more damaging than formerly. In 1607 the Spanish viceroy, the Marquis de Sallinas, engaged the services of a celebrated engineer, named Martinez, to undertake the drainage of the valley and the reduction of the volume of water in the lakes. Over half a century before a cut through the Nochistongo hills had been suggested, and Martinez took the idea up anew. On the 28th of November, 1607, in the presence of high civil and ecclesiastical functionaries, he began, with 15,000 Indians, the work of constructing a tunnel through the hills so as to give outlet to the waters. A year later he formally opened the tunnel, which was built of timbers supporting wooden cross-beams to keep the walls of the tunnel from caving in. The tunnel was about 20,000 feet in length. Some time after, it was found that the tunnel needed masonry, to keep the earth from tumbling in and filling it up, and archwork was put in at vast expense. But this work was done so unscientifically, the modern system of lining tunnels being unknown, that it led to a general caving-in of the work. In 1614 a Dutch civil engineer, one Adrian Boot, came over from Spain, and, after studying the situation, recommended protecting the city by dikes and mounds. His suggestions, however, bore no fruit. In 1629 Martinez perpetrated a bit of folly, only comparable to that of the conceited King Ahuizotl. Incensed at the many criticisms levelled against his tunnel, he had it stopped up, in order to give the people of the capital a demonstration of the needfulness of his work. The next morning a great part of the city was flooded, and so steadily rose the waters that it became a tremendous inundation, and for four years was Mexico flooded, causing, as was said at the first of this letter, a vast amount of damage. Canoes again became the regulation sort of thing, and bridges were built at places of convenience to the people.

The viceregal government went to studying the drainage problem all over again. They even tried bringing into the city the sacred image of Our Lady of Guadaloupe, but her presence did not have any apparent effect, and it was not till some earthquakes came along in 1634 that the ground opened and the waters disappeared. The damage to the buildings of the city was estimated at 1,300,000 livres, over $40,000,000.

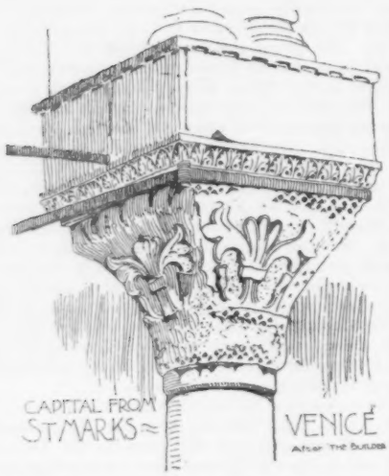
Finally, Cerral, who was then viceroy, ordered the release of Martinez from prison, and told him to go to work and perfect some plan for permanently relieving the city of danger of floods. A duty was put on wine consumed at the capital to meet the bills. Martinez puttered around for three years, accomplishing little, and his work was in 1637 put into the hands of a Franciscan monk, Fr. Louis Flores, who decided to abandon the idea of a tunnel at Nochistongo, and convert the work into an open cut. Somehow, the monks muddled the matter, and the history of the drainage projects for the next century is wearisome beyond endurance. There were all sorts of plans adopted, pushed for a time and then abandoned; whenever the lakes got very full, a panic would ensue, and there would be more digging at the great cut and renewed projects of dike construction. At last, in 1789, or one hundred and eighty-two years after Martinez began work on it, the cut of Nochistongo was opened substantially as it stands to-day. This cut of Nochistongo is familiar to thousands of Americans who have passed through it on the Central railway, which winds along a shelf of earth at a dizzy height above the trench in which the water runs far below. It is really a great engineering work, and if De Lesseps' descendants get through with the Panama canal in the same proportionate time, the opening ceremonies will occur some five centuries hence. The largest naval vessel could be floated in this cut, were it filled with water. It stands a monument to governmental procrastination and the blunderings of engineers.

I will not undertake to sketch the score of projects which have been considered in the last hundred years for the drainage of the valley of Mexico, nor will I go into details of the later plans of the Emperor Maximilian and his engineers, but will merely here state that Maximilian's tunnel will be an essential part of the scheme which the Cleveland company will work upon.

And all these centuries of effort, from the times of the Aztec kings down to the latest term of President Diaz, might have been avoided, had the Aztecs not been led by superstition to found their city in the midst of a lake, and had Cortez shown good sense enough to have built his capital at Tacubaya, on sloping land, out of all possible danger from floods. The valley of Mexico contains many better sites for a city than this undrained swamp, which at any point shows water if you dig from two to four feet, a city where to maintain a gas-service involves great expense, as the pipes are practically laid in water, and where no good system of drainage can be effected till the waters of the valley itself are drawn off. From King Ahuizotl to Engineer Shreve of Bucyrus, O., is a good distance in time, and we will await with interest the outcome of a plan which, if successful, will be one of the greatest achievements of the administration of President Diaz.— *F. R G., in the Boston Herald.*

THE SILENT BELL OF COLOGNE. — The Imperial bell of Cologne, one of the largest in the world, is famous not alone for its dimensions and its powerful sound, but still more for its persistent — silence. For now upward of four years its bronze mouth has not spoken; in fact, the bell has never yet invited the faithful to service, because it remains thus far unblessed by the church, although the present incumbent of the archiepiscopal see has resided nearly two years within the shadow of the dome. Quite recently the architect of the Cathedral formally appealed to the ecclesiastical dignitary, Dr. Krementz, who, however, lays the blame upon the government authorities. In turn, the Minister of Worship has since been addressed on the subject of the bell, and it is now believed that he will ere long take the necessary steps to have it solemnly consecrated.— *The American Register.*

AVIGNON.



THIS famous spot, like many of its neighbors, is treated with a very undeserved neglect by the noble army of martyrs who yearly submit to the penance which they call "travelling for pleasure." Most of them are in such a hurry to reach Cannes, Nice, Mentone, or some other "eligible resort" along the Mediterranean seaboard that the few who happen to be awake when Avignon is passed think of it only as one more station left behind on the Lyons and Marseilles Railway, and are rather glad to get rid of it. Probably not one person in a hundred among the crowds who rush past it every summer and autumn ever thinks of halting there, and yet there are few places between the Gulf of Lyons and the Bay of Biscay which are better worth visiting.

At first sight, indeed, the famous city of the Rhone is anything but attractive in appearance. Still preserving its mediæval character beneath the thin varnish of modern improvement that overlays it, it forms a perfect cobweb of narrow, gloomy, winding lanes, walled-in and overshadowed by huge, dismal stone houses, and recalling at the first glance those open-air catacombs which pass for streets in Genoa and other towns of Northern Italy. Three men walking arm-in-arm would amply suffice to block any of these pipe-like "thoroughfares," and should you happen to encounter in one of them (as we did on the very night of our arrival) an ill-tempered cow or a pugnacious dog you must either turn back or take your chance of a fight, for it is absolutely impossible to pass unmolested. One can fancy what famous hacking and slashing there must have been here in the old fighting days of the fourteenth century, when the trains of two hostile nobles suddenly came face to face, like the Capulets and Montagues of Shakespeare, in one of these dark, narrow, crooked alleys. Swords were soon out in those days, and the first words of defiance were hardly uttered when the whole street was one whirl of tossing arms and flashing weapons, growing redder and redder as the press of fight swayed to and fro, while the good neighbors watched the sport approvingly from their windows overhead, and occasionally administered a little Christian charity in the form of a heavy stone or a broken tile to some wounded man who happened to have fallen conveniently just underneath the casement.

But the ancient town assumes a widely different aspect when you pass through the river gate in the freshness of early morning, climb the broad winding stair leading up the massive ramparts that front the Rhone, and look down upon the serried mass of roofs and the great plain around them over the trim iron balustrades of a pretty little public garden which is perched like a bird's nest on the top of the wall. Just below you, casting a grim shadow over the smooth, bright waters from the tall square tower that guards its central arch, lies the ruined bridge that figured so prominently in the English illustrated magazines last November in connection with the floods in Southern France. A few hundred yards farther down the stream stands the new bridge, flaunting its smart modern trimness in the face of its maimed and disabled rival. And now the roll of a drum breaks upon the still air, and from a solid stone fort that crowns a low round bluff on the other side of the river pour forth like a swarm of ants a long stream of tiny figures in dark blue whose bayonets glitter brightly in the morning sunshine.

This narrow belt of level ground between the foot of the wall and the brink of the Rhone witnessed 105 years ago a very strange and memorable spectacle. One fine morning in 1782, just about the time when many of the Frenchman who had been fighting for American independence were beginning to straggle home again, there was a great excitement in Avignon. Through the river gate the townspeople came pouring by hundreds and by thousands to crowd around a group of local officials and scientific experts who were standing on the bank beside a large silken bag, which was heaving and bulging in a curious way as if it were being gradually inflated with air. The better informed among the crowd eagerly announced to their neighbors that the two men who were so busy with this bag of silk—"two crazy fellows named Montgolfier"—had undertaken to send it up into the air as an experiment, having been foolish enough to assert the possibility of making similar bags of larger size navigate the sky just as ships navigate the sea, carrying with them a number of men fully equipped with all necessary stores and implements. The general laugh which greeted the thought of such an extravagant absurdity had scarcely died away when the unbelievers were confounded to see the silken case (which the "two crazy fellows" had fully inflated by this time) give one final heave and then sail slowly upward into the air, passing over the town at a height of several hundred feet. The first balloon had been launched into space, and the news of this achievement drew forth a few months later the last flash of that caustic wit which had made so many enemies for Frederick the Great:

> "The French in balloons as their own claim the air,
> The English will domineer over the sea,
> The land Russia has, and no morsel can spare,
> Then fire—there is nothing but fire left for me."

On the other side of the garden a steep, zigzag carriage-road leads down into the heart of the city, debouching at length on a broad open space surrounded by houses, upon which a few score of dapper little French grenadiers—who would stand a very poor chance against a bayonet charge of Bismarck's huge Pomeranians and sturdy Brandenburgers—are going through the evolutions of their morning parade. And here you come suddenly face to face with the most enduring monument of that formidable though short-lived importance which this strange old place possessed five centuries ago. All along one side of the parade ground rises a vast gloomy building of dark gray stone, wearying the eye with a profusion of pointed arches, and grim, massive towers and machicollated battlements and loopholed turrets and carved gateways and shadowy niches without order and without end.

From the presence of the soldiers, who are constantly passing in and out, you might guess this edifice to be a barrack, although its dismal aspect and the iron gratings upon its small, narrow windows would rather suggest the idea of a prison. It is, in fact, used as both, and the selection is doubly appropriate, for this building was once the ancient palace of the Popes who had abandoned Rome as a residence—spiritual barrack for the Church's soldiers, and a spiritual prison for the souls and consciences of mankind. Here subsequently to 1378 reigned a line of Pontiffs, who, supported by the French monarchy that had created them, stoutly proclaimed themselves to be the only true and infallible successors of St. Peter, and denounced as impostors and wolves in sheep's clothing the wearers of the triple crown of the Vatican. The trouble and perplexity of Christendom, while the Church which was the sheet-anchor of her faith was thus divided against itself, may be easily imagined. "Rome," says a great historian, "cried out against the corruptions of Avignon, while Avignon, with equal justice, recriminated upon Rome, and the many devout Catholics who were honestly anxious to reverence and obey the Pope as the vicegerent of God upon earth found it no easy matter to decide to which of the two worthless priests that were cursing and reviling each other the dignity of God's vicegerent really belonged." But unluckily for these latter Popes of Avignon—French anti-Popes as they are called—there were in France, during the stormy period of their denomination, certain daring spirits upon whom that familiarity which proverbially breeds contempt had produced its natural effect. Having seen what they could hardly avoid seeing, viz., that these spiritual despots, while claiming to hold the keys of heaven and of hell, were openly submitting to the dictation and obeying the commands of the King of France, the bold cavaliers of Bretagne and Normandy began to think, not without some show of reason, that the ecclesiastical thunders which had so manifestly proved powerless against their royal master would probably be equally ineffectual as regarded themselves. The result of this conviction was not slow to make itself felt. In the height of France's distress, when the dreadful wars of Edward III and the countless horrors that followed in their train were draining the very lifeblood of the unhappy kingdom, the Cardinals and other priestly dignitaries of Avignon—who, like many other "good shepherds" of that age, were fattening while their flock starved—heard one morning the watchman on the highest tower of the city rampart announce that an armed force had appeared in the distance, which seemed to be advancing straight upon the town. This of itself was such a common occurrence that nobody would have thought anything of it had it not speedily become evident that the troops were preparing to encamp under the walls, while a strong body of horsemen were riding at full speed up to the nearest gate.

Before any one could decide what was best to be done, a clang of armor and a trampling of hoofs echoed through the ancient town, and the daring intruders, riding along the narrow and perilous streets as fearlessly as if still in the open plain, halted in the open space fronting the Pope's palace, and silently ranged themselves in order before the great gateway. All were men of goodly stature and powerful frame, and all had their faces hidden by their closed helmets, excepting their leader himself. The latter, whose features were fully visible, was a short, thick-set, hideously ugly man in black armor, swaying in his brawny hand a ponderous battle-axe, which few ordinary men could have even lifted. Many looks of half-terrified admiration were cast at him from the crowd which had been gathered by the coming of the strangers, and the townspeople told each other in whispers that this could be no other than Bertrand du Guesclin, Constable of France, the bravest soldier and the best General of his time, who is still the hero of countless legends in every part of his native province.

And now three or four tall figures in black robes, issuing from the huge, shadowy gateway, demanded with a would-be menacing air who were those godless men that presumed to appear in arms before the Holy Father's own palace. But their assumed haughtiness

melted like snow before the stern soldierly bluntness with which du Guesclin replied that when the people had so long given money to the Church it would be only fair that the Church in its turn should give a little money to the people — that he had that very day ridden through four villages whose inhabitants were starving — that his own men were unpaid and hungry, and that, therefore, he Bertrand du Guesclin, as a true servant of his Holiness, the Pope, had come hither to ask the cardinals and clergy of the good town of Avignon to contribute somewhat from their abundance toward the necessities of their poorer brethren, and he trusted that they would not shame themselves and their master by refusing.

The significance of the ironical emphasis laid upon these last words was formidably pointed by the grim laugh that came rattling through the barred helmets of those armed statues who sat erect on their war-horses behind the speaker, and the papal envoys retired in a perturbation which extended itself throughout the entire palace as soon as the stern message became known. The wealthy churchmen were naturally indignant at finding themselves so unceremoniously called upon to pay taxes instead of receiving them; but, on the other hand, Bertrand du Guesclin was not a man to be trifled with. What was to be done? Several of the local dignitaries came forth in their richest robes and used their best rhetoric and their smoothest flattery to soften this stiff-necked "son of the church." But the stout Breton was not to be either convinced or cajoled. One inventive cardinal considerately proposed to raise the required sum by levying a "benevolence" upon the already impoverished people of the city; but the black frown which overspread du Guesclin's rugged features at the base suggestion palsied the words on the speaker's tongue before they were fully uttered. At length Bertrand, growing impatient, broke up the conference by declaring, with an omnious flourish of his terrible battle-axe, that if the money were not forthcoming within two hours he should know how to find it himself. There was no resisting such persuasion as this, and before the appointed time had expired the hero and his men were riding back to their camp with the full amount which they had demanded, pursued by a shower of elaborate Latin curses, which, coming from such a source, were probably quite as gratifying to du Gueslin as the subsequent blessings of the famished men among whom he divided the proceeds of this novel subscription.

Not many years later on in the same century there occurred another and even more striking illustration of the extent to which the prestige of the papacy had already been weakened, even during the period of its most overweening assumptions. A reckless French adventurer, the captain of one of those bands of "Free Companions," who were so very "free" that most people simply termed them robbers, finding that no more plunder was to be squeezed out of a country which war and pillage had turned into an absolute desert, was suddenly inspired with a new and brilliant idea. This was nothing more than to make a sudden dash upon Avignon, kidnap the Pope himself, put him to ransom, and then compel him to give his captors full absolution for the deed before letting him go. The chief's wild followers took up the project with professional enthusiasm, and for a while everything promised well for its complete success. One can scarcely help regretting that the world should have missed such an admirable opportunity of ascertaining the exact market value of a Pope in those days, and of learning how far it exceeded the £400,000 ($2,000,000), which the sale of Charles I by the Scotch three centuries later, established as the fair price of a king. But, as Carlisle has truly said, he who would keep a secret must conceal not merely the secret itself, but also the fact that he has one to conceal. One of the bandits, having allowed himself to be overcome by the good wine of the Rhone, began to boast with drunken exultation of the rich prize which he and his companions were about to capture. A quick-witted monk, who happened to be within hearing, lost no time in apprizing the Pope of the favor designed for him, and when the banditti came up to the gates of Avignon they found that the Holy Father had been forewarned of their intended visit and was "not at home."

But the ancient city of the Popes has other and more modern associations connected with it, the fame of which will probably outlast that of any Benedict or Innocent of them all. Not many, indeed, would care to linger over that hideous dungeon in the "Ice Tower," from the darkness of which one fatal morning during the fury of the Revolution the horror-stricken citizens dragged up "130 corpses" of men, women, and children, gashed and mangled by the sabres of Jourdan's red-capped murderers. But there are few American or English travellers who would not gladly turn away from the stately tomb of Pope Innocent VI or the ornamental shrine of Pope John XXII (the greatest villian that ever wore the triple crown, except, perhaps, Alexander VI himself), to the quiet cemetery in which stands a plain gray stone bearing the name of John Stuart Mill. The great logician and philosopher had his faults like other men — faults which his enemies exaggerated to the best of their small ability — but even those enemies were forced to admit the sterling quality of the material that underlay these trivial blemishes. History has already chronicled that when Mill's election to Parliament was swaying in the balance, and all the chances seemed to be against him, he was asked by an assembly of the workingmen upon whose votes his success depended whether he had not once said that the working classes are given to lying. "I did," answered Mill, without a moment's hesitation, and the hearty cheer which applauded the manly frankness of his confession proved that the sturdy artisans who heard it could recognize a true man when they saw him. — *David Ker, in the New York Times.*

THE RECENT PANIC IN NEW YORK.

WHAT the prosperity of the many is dependent on the prosperity of the individual, that one profession, trade or calling cannot continue to grow and prosper in a time of general stagnation and distress, and that the reverse of this proposition is equally true, is, perhaps, not often thought of in times like these, when everything is "booming." Architects, we take it, do not study the financial, stock and market reports unless they have some momentary interest in a single transaction. It may not be unwise, then, to show them how far their well-being is dependent on causes and conditions that have their growth far remote from the affairs with which they are habitually concerned, so it has seemed to us worth while to reproduce from the *Saturday Review* the following financial article, which is put in such simple language that every one can understand it, and by it be awakened to a realizing sense of how far the prosperity of a single individual of any nationality is affected by the great questions that are usually supposed to be the concern only of statesmen and great financiers:

The sudden and short-lived panic in New York on Friday of last week, and the depression in the stock markets which has continued since, are the result partly of the war scare in Europe early this year, and partly of the dearness and scarcity of loanable capital in the great cities of the Union. When the revival of trade in the United States began, about two years ago, there began also the buying of American railroad securities by European capitalists and speculators. The buying went on all through the autumn of 1885 and throughout the whole of last year, when suddenly Prince Bismarck's speech in the Reichstag alarmed the whole Continent for the peace of Europe, and a scare upon the Bourses and Stock Exchanges followed a few weeks later. The scare was particularly severe in Paris, and the selling extended, not only to all of what are called International securities, but to American railroad securities also; perhaps, indeed, it would be more correct to say that American railroad securities were sold on a much larger scale and more recklessly than anything else, because other securities were at times entirely unmarketable, and there were always buyers, at a price, of American railroad securities. The selling went on from every European capital; but, as we have said, it was especially large from Paris. It is asserted that a single Parisian great capitalist sold not far short of a million shares of American railroads in the course of a few weeks. The securities were bought almost entirely by the capitalists and speculators of New York, and they were bought, too, at a comparatively small fall in price. In New York it was then supposed that the question of war or peace would be very speedily decided; that if peace was assured confidence would at once return and securities would be bought back, leaving a handsome profit to the New York purchasers, while if war broke out it was assumed that capital would be remitted in very large amounts from those countries likely to be the theatre of operations, and would be invested for the greater part in American securities, as they would be entirely out of the range of hostilities. As a matter of fact, however, though peace has continued, uncertainty has not been put an end to. Every one now hopes that there will be no war, at any rate for this year; but everybody sees very clearly that all the conditions which made war appear imminent a few months ago exist to-day. There is thus no return of confidence, and consequently there has been no buying back by the sellers of January and February. The great capitalists and speculators of New York have found that the shares and bonds which they bought in such immense quantities at the beginning of the year remain on their hands, and that purchasers for them are not likely to come forward very early. They had bought, as we have said, in the confident expectation that they would be able to sell again very soon at a handsome profit, and they find their expectations disappointed, and no prospect of a demand for the securities at an early date. Of itself alone this was sure to bring about a fall in prices. The great capitalists, of course, can afford to wait. They know the value of the securities they bought; and, having once paid for them, they can put them away until a favorable moment returns. But speculators are not in the same comfortable position. They have to borrow the money with which they

buy; they cannot wait indefinitely, therefore, for a sale — sooner or later they are obliged to realize, and the condition of the New York money market has compelled numbers of them to end their speculation rather precipitately.

The extraordinary improvement in trade which has been going on for the past two years has, of course, been accompanied by a wild speculation in every direction. Railway building is being pushed forward more rapidly than ever before — which means, we need hardly say, that too much capital is being sunk in that form, and in too short a time. The iron trade and the coal trade are being stimulated by railway building. And house building in the great cities is being pushed forward rapidly. In thirty-five cities of the United States the estimated value of new buildings in the first five months of the current year shows an increase over the first five months of last year, of about 22 per cent; and in forty-three cities of the United States the estimated value of the transfers of real estate, also in the first five months of this year, shows an increase over the corresponding period of last year of about 52 per cent. All this clearly proves wild speculative building, and still wilder speculation in land. We know how reckless has been the speculation in wheat and coffee, and, in short, in every direction there is a mad speculation going on. All this creates an extraordinary demand for money. Cash is needed to pay work-people, to increase workshops, to provide the materials for railways, houses, and the like, and also for moving all sorts of commodities by railway. And the increase in the currency of the United States thereby required has led to an abnormal withdrawal of money from New York for all parts of the interior. The National Bank-law requires that National Banks shall always keep 25 per cent of their net deposits in cash. If they fail to do so the Government Inspector may require them to make up the amount within thirty days, and if they fail, may close the bank. The penalty, it will be seen, is a very severe one; but naturally it is not often enforced. Recently, however, a Government examiner, being dissatisfied with the securities held by a bank in Cincinnati, and being convinced that the directors and officers had been guilty of fraud, actually proceeded to close the bank, and declare it insolvent. This act of vigor on his part has naturally brought home to bank managers throughout the Union that at any moment they may be treated quite unceremoniously also if they infringe the law. Now, the demand for coin and notes all over the Union has drawn so heavily upon the resources of the banks associated in the Clearing House of New York, that out of about sixty-three, no more than three or four now hold in cash more than the 25 per cent of the net deposits required by law. In other words, only three or four of the banks in New York which hold the ultimate banking reserve of the United States are any longer in a position either to lend or to discount. They have to obey the law, and if they do not obey the law, they are liable to be closed within a month by a Government official. Being in this state it is easy to understand that several of those banks have been calling in loans. Probably it was the pressure put by bank managers upon those engaged in the "corner" in wheat and coffee that broke down those combinations, and there can be little doubt that the same kind of pressure had something to do with the panic in New York on Friday of last week, and with the fall in prices that has been since going on.

The demand for money because of the improvement in trade and the reckless speculation going on in all directions is not the only reason of the difficulty in which the Associated Banks of New York find themselves. As our readers are aware, the revenue of the United States greatly exceeds the expenditure, and the surplus has been employed ever since the close of the War in paying off debt. Within the past seven or eight years the surplus so applied has been enormous in magnitude, with the result that the debt has been redeemed at an unprecedentedly rapid rate. But the National Banks of the United States are allowed to issue notes only on condition of lodging as security in the Treasury interest-bearing bonds of the United States. Consequently, the redemption of debt by calling in bonds from the banks which had lodged them in the Treasury as security has compelled those banks to diminish their notes in circulation. There being no means in the United States by which a bank can recover and cancel notes issued by it, the banks which have been unable to do so are obliged to lodge in the Treasury an equivalent amount of Treasury notes or of coin; and thus there has been a contraction of the currency either in the form of bank-notes or of Treasury notes, or of gold and silver certificates, or of coin. Meanwhile all the bonds that can be called and redeemed at par have actually been called, and the last of them were to have been redeemed yesterday; and in consequence the surplus of revenue over expenditure has been accumulating in the Treasury. Thus the New York money market has been drained in two directions; money has been going from it into the Treasury, and going from it also into the interior for trade purposes, with the result, as we have said, that the greater part of the banks are unable for the time being to do the business for which they exist. Trade, however, is carried on chiefly by means of banking accommodation, and so is speculation; and when bankers are unable to give the accommodation which they were established to give, and which their customers naturally look to them to furnish, those customers are unable to carry on their transactions, and a breakdown in the speculative markets is a necessary consequence. Considering all things, the breakdown has been less than might reasonably have been expected. It is evident that the great capitalists must have exerted themselves very much to support the market, for we had a combination of circumstances which otherwise might have produced a panic — dear and scarce money; failures in wheat and coffee; one glaring bank failure, with a case of fraud; reports that numerous other banks were in a serious position; a vast speculation of every kind and in every direction, and a large quantity of bonds and shares bought months ago in the hope of being sold rapidly, and for which no market was available. Under these circumstances a very serious fall all round would not have been at all surprising. But the purely commercial conditions were highly favorable. Trade, as we have said, is improving in all directions; railway earnings are increasing at an extraordinarily rapid rate; dividend prospects consequently are good; confidence in the future is high, and, therefore, the great capitalists would appear to have come to the support of the market, and the crisis has been tided over with a much smaller fall and with much fewer failures than could reasonably have been looked for. Speculators, of course, took advantage of the combination of adverse conditions to force down prices for their own profit. Mr. Jay Gould has the credit of leadership and of having made large gains. But speculative manipulation could have done little, were it not for the scarcity and dearness of loanable capital and the political apprehensions that have disturbed Europe.

BOOKS AND PAPERS.

"INADEQUATE," "incomplete," and "inaccurate" are the alliterative adjectives that occur to us as we turn from this book,[1] which is the outcome of "twenty years of constant study." The time, perhaps, was not too long to devote to the preparation of an American glossary of architectural terms, but it is regrettable that more of it was not spent in weeding out from terms which purport to be first of all American, a great deal of rubbish that is antiquated, obsolete, or foreign to the tongues and understandings of Americans. We like to commend a book heartily when we can, and we often can and do, and we like to condemn a wholly bad book with equal heartiness; but this book falls entirely within neither category, and therefore must be treated in both ways.

First, then, it is commendable, as are most Chicago publications, for being well printed on fine paper, and bound in a substantial letherette binding, not the least of whose attractions is the design which ornaments the cover, a design which represents (pigeons and all) a drawing made in the office of Mr. T. P. Chandler, and published last year in the *American Architect*. Next, it is well arranged, and different spellings of the same term are bracketed together, prefixing a common definition. The illustrations being selected fragments of drawings published in other books and journals are attractive, and give a certain air to the book, This is about all that can be said honestly in praise of the book, though its greatest merit, its brevity, and the conciseness of its definitions must not be overlooked.

No book should be so keenly scrutinized or so severely criticised as a dictionary of terms, since in its accuracy lies its whole value; for if it is misleading in its definitions, those who rely on it are always at a disadvantage with others who have more trustworthy aids to turn to when a new word or phrase is encountered; so we feel that we ought to justify our introductory adjectives by explaining why it is that our hurried examination of the book has left checkmarks on almost every page, which indicate inaccuracy of one kind or another.

Old English terms, Latin and Greek terms, French, German and Italian terms are fairly in place in a complete dictionary, but a "glossary," and particularly a glossary of American terms, would have been more serviceable if such rarely useful lore had been omitted. A single page, taken at random, contains these extraordinary words: Bubata, Buerania, Bulenteria, Bulker, Burton, Bustum, Caer, Calcatorium, Caloke, Camarila, Camaroris. What use has the audience to whom this book is addressed for definitions of such words? On those rare occasions when they are encountered, if the context does not give the clue, recourse can be had to a proper dictionary, or they can be skipped without much loss to the reader. In place of these words definitions of terms in common use should have been given as, for instance, of lewis, flitch-plate, lever, crab, crane, derrick, winch, and a hundred others which will occur to any one who spends half an hour in searching for omissions, for most tools, materials and processes have been neglected in favor of foreign and obsolete names of architectural members and features.

The inadequacy of the definitions is more amusing, though less harmful, than the incorrectness. Who, for instance, could detect that by "a metallic invention used in building" it was intended to declare the humble but useful *nail*? "Polychromy," it appears, is "a term synonymous with fresco painting." "Wrought-iron" is "pure iron in a natural [*sic*] state." A "joiner" is "a carpenter or builder." "Flamboyant" is "a name given to French-Gothic art." A "cylinder" is "a figure having a circular plan" — a cone, for instance. We hope that no simple-minded architect intending to

[1] "*The American Glossary of Architectural Terms*," being a concise and comprehensive compilation of all terms used in the practice of architecture and the building arts: a complete dictionary of over three thousand terms, historical, descriptive, theoretical, mechanical. Illustrated by many selected and original drawings. By George O. Garnsey, architect, Editor of the *National Builder*, Chicago, Ill., 1887.

tell a lady client that she can easily have a "bath-tub" in a certain room may take Mr. Garnsey's word for it that he may properly intimate to her that in that room she may set up a "bagnio."

As samples of mistaken definition we quote "Anthemion" which is said to be "the spiral of the Ionic volute," and which is explained by a cut showing a *Roman* Ionic capital. It is now generally understood that this word indicates the honeysuckle ornament on the necking of a Greek Ionic capital. "Garrison" is said to be "a fort, citadel or castle." "Impluvium" is declared to be a "Roman cistern" instead of the exposed portion of the inner court of a Roman house. "Corbie steps" are given as "a corruption of corbel-table," whereas this is the Scotch name for the "crow steps," the distinguishing feature of stepped gables in Scotland and the Netherlands.

As samples of typographical inaccuracies we have "verandah," "frustrum," "valarium," "consol," "insulated" for "isolated." Of the blunders natural to a man who has never had or has not profited by a college education it is enough to point out that if a definition of the word "strix" was given there was no reason for giving a definition of its plural "striges."

It really seems to us that the first edition of this book is hardly worth buying, for it is not supposable that such a hasty glance as we have given (reading, perhaps, one definition in fifty) has discovered all the errors.

PHOTOGRAPHY and the allied arts which have done so much to popularize the cheaper forms of illustration and to bring to the public the works of the great masters without the element of excessive cost, which was such an obstacle in bygone times, have rather led us to forget or lose sight of the works of the engravers of past schools. Engraving itself has changed a great deal since photography has been employed as an adjunct to drawing. It is very seldom that one sees a pure line engraving produced by modern artists. By pure line we mean an engraving on copper made entirely with the burin without any of the seductive aids which modern engravers add to their work in the shape of mezzo-tints — process reproductions, and the like. Only in Paris is there any systematic school of engraving at present, and we believe that only in the Louvre itself is pure line engraving taught and practised. But, nevertheless, though photography has replaced engraving so largely as a process, public interest has never diminished for the works of the old artists of the sixteenth and seventeenth centuries. Those masters of engraving wrought with their burins, not merely thinking out the ideas of other people or tamely copying what other artists had put before them, but bringing their own personality to bear upon the art which they had undertaken, evolving a style of engraving which has never materially changed. Compare any two of the old engravings with the work of such magazines as *Harper's* or the *Century*, and the difference will be very strikingly made manifest. It is not in place here to discuss which is the better process, or whether, by imitating so largely the touch and texture of paintings the engravers have lost their own share of individuality in art; but certainly, every one will agree in admiration of the older styles.

Gerard Edèlinck,[1] perhaps the most famous of the French engravers of the past, though belonging by education and by his work to Paris, was born in Antwerp in 1640. Our biographer does not have very many facts to tell us about him any farther than that he was in the studio of Corneille Galle, at Antwerp, until he had exhausted all that the Flemish city could afford him, migrating after that to Paris where he established himself in association with a number of other Flemish artists, and immediately began to receive public notice as a skilful and artistic engraver. He became the intimate friend of Phillippe de Champaigne, and was taken up by Colbert and given every advantage for his art. With such high protection he had every opportunity that an artist could wish, and the best painters of his time, Le Brun, Mignard, and others, seem to have been only too glad to confide their best works to his care; indeed, it is owing to him perhaps more than to any other engraver that we are able so thoroughly to judge of the painters of his century. It is difficult to believe that while all other branches of art should have advanced so much since his time, the art of engraving has remained practically stationary, and that hardly any one since his time has in any way excelled him. Delaborde tells us that he got his great renown at the time as well as a great share of the admiration in which he is now held, from the power he possessed more than any other man of his time of subordinating himself entirely to the work he had before him, so that one can trace in his engravings the peculiar methods of the painter. At the same time he always had his full share of originality, and in reproducing a painting which had been carelessly or slightingly rendered in detail by the author, he would manage, by skilful use of his lines and lights and shadows, to bring out and accentuate the true intent of the artist, thus giving an added value to the work, while, at the same time, he secured the good will of the artist, who was naturally desirous of seeing his work represented in the best way. Possibly we should not consider this method an advantage now, for we are told constantly that the engraver must not think for himself, that he must not try to translate the painter's language into another tongue, but speak as the painter speaks. Certainly, the old masters never did this, either in Italy or in Germany. An engraving always has its peculiar qualities, which, while representing the picture faithfully, represented it, so to speak, in a different light, thereby adding a charm to it. Take any volume of the *Century* or *Harper's* and one who is at all accustomed to drawings can readily tell by an examination of the engraving in what medium the artist worked, whether in water-color, pen-and-ink, or pencil. It was never so with the old engravers. They used lines purely as such always, and there were few expressions which they could not obtain by the continuous flow of curves and straight lines. Engraving in those days was an art by itself besides being a process of reproduction.

Edèlinck was an exceedingly industrious man. There are more than three hundred and thirty plates in existence which were entirely engraved by him within the space of a little less than forty years — perhaps as much work as might be expected of all the engravers of his time put together. Our author tells us that he had very little help in his work, that all his engraving was by his own hand, and that the pupils, whom he had in numbers, never did anything upon the plates which Edèlinck signed, at least, to any more than put in a frame or a background. Edèlinck was one of the first members of the Académie Royale, an honor the more deserving of mention in that he was not a Frenchman by birth, and, indeed, could hardly speak the French language correctly. He was, also, if we are correctly informed, the first director of the Gobelins after Le Brun. He was allowed a lodging with a pension of fifty crowns, and the title of perpetual professor at the academy established for the instruction of artist weavers. He lived in the Gobelins, following his profession as engraver and directing the manufactory until his death in 1707.

Delaborde sums up his artistic qualities in saying that his works satisfied all the conditions of engraving, and that one may, therefore, in strict justice, consider him, if not the first, at least the most harmoniously organized and the most complete of all engravers. Were it not for the excellent engravings which accompany this biography, all of them taken directly from the works of the master, it would be a weariness to the flesh to undertake the reading of it, for M. Delaborde is anything but an entertaining writer, and he wastes so many pages in idle speculation as to what Edèlinck might have done, or what may have been his artistic inspirations and guiding forces that we are tempted to believe he did not know very much about it, and doubtless this is true, for even the best artists of Edèlinck's time lived comparatively obscure lives, and it is only by little incidental remarks here and there in current histories that we obtain any documents in regard to their lives. The biography is valuable as a document, and as an illustration of this best of French engravers, but it it hardly the work with which to while away a summer afternoon.

[1] "*Les Artistes Célèbres: Gèrard Edèlinck*," par le Vte. Henri Delaborde. Paris; J. Rouam, Editeur.

COMMUNICATIONS.

STAR-SHAPED CHIMNEYS.

LEICESTER ROAD, NEW BARNET, NEAR LONDON, June 30, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — In answer to your favor of May 28, *re*, star-shaped chimney: Some years ago I gave considerable attention to this section of shaft, and since receipt of your inquiries I have consulted with some eminent builders of this class of work. I cannot hear of a single example of such a shaft being built in England.

In my work on "*Tall Chimney Construction*," pages 101–102, I give an account of a similar shaft, 121 feet high, built for the Pennsylvania Railroad, West Philadelphia shops, illustrated by diagrams Nos. 54 to 59.

Experts on chimney-building in this country say they are more *costly* to erect, the corner or angle bricks require more care and labor in setting, and they catch much more wind, than if they had a *circular outer case*.

I have delayed answering your letter as I was anxious to get other opinions than my own. Yours faithfully,

R. M. BANCROFT.

THE "GUTTER-SNIPE" IN ARCHITECTURE.

NEW YORK, July 12, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — While engaged in superintending some work in this city, recently, a lad, inquiring for the owner and his address, handed the enclosed pamphlet to me, with a request that I give it to the owner. As the communication was sealed and addressed, I at once presented it to my client, who immediately returned it to me, together with some few remarks, which were not at all complimentary to the "compiler."

. It would be interesting to me, as well as to many fellow-architects who have heard from the "compiler" in a similar way, to hear your views as to this method of increasing one's professional acquaintance.

Yours, etc., W.

[As might be guessed from the context, the "compiler" gives himself out as an architect, and the object of the compilation — a little pamphlet the cost of the manufacture of which is evidently borne by certain dealers in building materials who have placed advertisements in it — is to sell for $25 plans and specifications for a 16′ 8″ front house, and, if possible, the interior details of the same for an added $15, and again to obtain, still, if possible, $10 more for filing the plans and specifications with the proper authorities. What a professional man may with propriety do to extend his business and increase his income is a delicate question. But we feel that the line of decent behavior should be drawn at some perceptible distance from the pestiferous gutter-snipe. — Eds. American Architect.]

NOTES AND CLIPPINGS

Landslips in Switzerland. — The late accident at Zug recalls the more startling and much more fatal Goldau calamity of about 80 years ago. This Goldau lies at the other end of the Lake of Zug and is nestled in a valley lying between the Rigi on the one side and the steep Rossberg on the other. Both mountains are made up of conglomerate, interstratified with soft sand rock with the strata pitched at a very steep angle. The strata of softer rock disintegrate rapidly on exposure to the air, and at times become so charged with infiltered water that they are squeezed out by the weight above them and descend into the valleys as torrents of mud. This was the case in 1806 when a huge mass of the Rossberg, over one mile long, 1,000 feet wide and 100 feet thick, slid down from a height of 3,000 feet into the narrow valley, overwhelming with mud and the rocky chaos of superincumbent conglomerate four villages and 457 of their inhabitants, and filling up one-fourth part of Lake Lowerz. The scarred side of the Rossberg still indicates the path and extent of this great land-slide and the Luzerne — St. Gothard railway now passes over the wreck with its huge piles of rock and stagnant pools of water between. The Zug accident was undoubtedly the result of a similar sequence of geological events, the formation being identical, we understand. — *Engineering News.*

Electrical Motors for Cars. — Experiments recently made with electric-motors show encouraging progress in the art of applying electric force to street railways, and it now seems probable that within a few years this force will be substituted for horse-power on hundreds of miles of road. The managers and owners of street railways are manifesting great interest in the tests to which the new motors are being subjected. The rejection of horse-power to make way for electricity upon the street railways of our large cities appears, remarks the *New York Times*, to await now upon the successful development of certain methods of applying the force and a demonstration that running expenses can be reduced by the change. The recent tests of the storage-battery motors in this city seem to point to the ultimate selection of such motors for use in crowded streets. Last week an ordinary car moved by a storage-battery passed repeatedly over the Fourth Avenue surface road. At times the speed was twelve and even fifteen miles an hour. The car was easily controlled. The speed was governed without the slightest difficulty, and stops were made with greater precision than is attained when horses are used. It is stated that a car moved by such a motor can be used at a cost of $4.10 a day, while the cost of the same amount of service with horses is $7.50. If this be true, no objection on the score of expense can be urged.

Many will be surprised by the statement that more than 3,500,000 passengers are carried annually in this country on street cars moved by electric-motors. In Montgomery, Ala., electricity is used on eleven miles of road, and the cost is reported by the general manager to be only one-half the cost of horse-power. Roads on which electricity takes the place of horses are found in Baltimore, Los Angeles, Port Huron, Detroit, Scranton, Appleton, Wis., and Denver. Electric railways are either in course of construction or under contract in twelve other cities, and in thirty-seven companies have been formed, or other steps taken for the building of such roads. Upon none of the roads now in operation in this country, however, is force supplied by storage-batteries attached to the cars. In most cases power is communicated by an overhead conductor. More than 3,000,000 passengers are carried every year by electric railways in Europe. The Frankfort-Offenbach line has four miles of double track, uses fourteen motor cars, and carries 900,000 passengers. The power is communicated by overhead slotted tubes. But the roads in Brussels and Hamburg are operated by storage-batteries upon the system tested last week in this city.

The system of independent motors attached to cars is clearly to be preferred, if it will do the work that is done by the more cumbrous systems, and do it at no greater cost. The storage-batteries can be placed under the seats of a car. They are so arranged that the amount of force used can be quickly reduced or increased by the driver. Each car is independent of all others, and its movements do not depend upon the transmission of force from a stationary centre of generation. A car using an independent and detached motor must be more serviceable under certain adverse conditions than one to which force is transmitted. Therefore, the successful development of this system is greatly to be desired.

Street cars operated by independent electric-motors that are easily controlled and capable of carrying passengers at the rate of twelve or fifteen miles an hour are greatly to be preferred to cars moved by a cable. The whole line may be blocked on a cable road by the failure of the cable or by any accident that checks its steady movement. The cable system is not fitted for use in the narrow and crowded streets of a city like this, but cars moved by storage-batteries would probably meet all the varying conditions even more successfully than cars moved by horse-power. The advantages to be gained by the substitution of independent electric motors for horses in New York are many and important. The greatest of them would be the removal of thousands of horses from the streets, the abolition of the enormous stables whose accumulations poison the air, and the abatement of dangerous nuisances caused by the storage and transportation of manure that has been taken from the stables. Citizens will rejoice if the companies shall decide that the change can be made. — *Electrical Review.*

TRADE SURVEYS

All of the trade indications point to an enlarging demand for all kinds of raw material and manufactured products. The agricultural interests are in a thriving condition, although there is, or will be, a deficit of ten per cent in the wheat crop — which will be partially compensated for by an increased corn crop. A heavy cotton crop is assured, and a very heavy demand for the product will help to maintain prices at a point which will encourage the extension of the cotton area. The wool clip will not be behind former years; but at present, prices are not so strong, because of the dulness in products, which, however, may be shortly corrected. Our export trade is in excellent shape, and for the four principal products — breadstuffs, provisions, cotton, and petroleum, the ratio for the past season as against the previous season was as fifty to forty-six. The reports from one hundred and thirteen railroad companies for June show an increase of over $3,000,000, and for six months the increase on one hundred and eleven railroads is equal to seventeen per cent against the same six months last year. Demand for all kinds of machinery and motive-power continues to increase. The larger establishments in the New England and Middle States have, within the past ten days, booked some of the largest orders of the season. The large industrial establishments projected in the South are also being heard from in the way of orders for all kinds of enormous and costly equipment. Investors are putting in the best, regardless of cost, and in this respect are gaining economic advantages. Some observers in the Southern States, incline to the belief that the investments there are going too far; but this is a mere opinion. This is an exceptional era, and it is mere guesswork to say whether the extraordinary activity is wise or not. The investments may not yield the anticipated returns for a year or two, possibly; but that fact is immaterial to the general public. The capital is better invested and employed, even at narrow margins, than it would be remaining unemployed, and perhaps diverted into speculative channels. The upward tendency which is manifesting itself in several industries, is helping to steady demand. Consumers do not believe that higher, or even high prices can be maintained without enormous productive capacity, and in this they are, no doubt, right; and sooner or later a downward tendency will be developed. Five months ago steel-rail makers expected to sell rails at this time at $42.50 at mill; but large orders have been taken within a week at $5 per ton less, to keep out foreign rails. Bars and plates have advanced slightly, and special brands of pig-iron have also improved. Old rails have advanced to extreme prices and will decline as soon as foreign supplies can be received.

The lumber trade is very active in spite of the season. The possibility of an advance later on has led to the shipment of large quantities of white pine to the East. Yellow pine has been received in large quantities, and the entire lumber situation is exceptionally strong. The railroad and building demand is extremely heavy. The statistics furnished at different points show that building activity is still surpassing its best previous records. Even throughout the East much more building is being done than last year, and permits for new work are being taken out for fall work. Matters are shaping themselves right in Chicago, and in the far Northwest building operations are being pushed as fast as material can be supplied. In the Ohio Valley a great deal of new work has been projected within a month, which seems to be the reflected light of activity in the Southern States. A great many little industries are springing up near the sources of coal supplies, and cheap lumber. In a great many localities in the Ohio Valley land has improved in value, and house-building is following in the wake. Architects in Cincinnati and Louisville say that the indications are very favorable for greater activity in this direction than heretofore. The working classes have put up with indifferent accommodations, and a spirit of enterprise, it seems, has now taken possession of them, which has been stimulated by the formation of building associations in some localities. Taking the West all through, the evidences are not wanting of an improving condition of trade and industry. The mines have been worked better this year; the foundries have been busier; the agricultural-implement works have had very little idle time, and all those industries connected with the cultivation of the soil have been improving steadily since the opening of the year. The satisfactory conditions throughout the States on this side of the Mississippi appear to be checking the outflow of population which showed itself last year. And there is more contentment among the wealth-producers of those States.

The boat-yards along the lakes, the furniture-manufacturers throughout the West, the tool and implement makers both East and West, and the car-builders have all had an unusual amount of business placed before them, and the order-books of these concerns are better filled than they have been for many years. This active industrial condition throughout the West is exhibiting results in the accumulation of orders farther East. In the New England States a large amount of work has been taken for the West in electrical appliances, in paper contracts, in cotton and leather goods, and, in fact, in all the products of Eastern factories and mills. Factory capacity is not being increased as fast as it would have been under other circumstances. In the New England States new mills are being built, and old ones extended, but there is a cautiousness which shows that trade requirements are very closely studied. It is only among the iron and steel makers that there are many appearances of rash expansion; these interests may be right in pushing work as fast as they are, and they justify their course by pointing to the importations of 100,000 tons of foreign iron and steel per month. The possibility of an industrial disaster, in view of all these facts and conditions, is remote; but wise men are watching the course of things with the greatest care. If we take out the factor of railroad construction at the rate of 10,000 miles per year, it is easy to see the results that would follow. There are more probabilities of an increase in railroad construction beyond that limit than a falling below it. Yet, after all, the purchasing-power of the masses must be preserved. Other problems have to be studied and solved, than those involving the greatest possible production of a given capacity. The prosperity of the country depends upon something more than making numerous wheels, and turning them rapidly. The distribution of wealth must gradually approach an equitable basis, however that is to be accomplished.